Contractor _____ Set No. _____

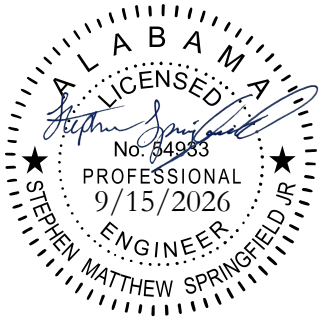
PROJECT MANUAL FOR
CITY OF SHEFFIELD
SANITARY SEWER LIFT STATION IMPROVEMENTS
PROJECT NO. AL 22241-2025/24-0032A

Prepared for:

City of Sheffield

Colbert County, AL

September 2026



Prepared by:

THE KELLEY GROUP
▪ A CIVIL ENGINEERING COMPANY ▪

City of Sheffield
Sanitary Sewer Lift Station Improvements

ARC Project No. AL 22241-2025/24-0032A

Colbert County, AL

OWNER

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INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

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

A. *Bidder*—The individual or entity who submits a Bid directly to OWNER.

B. *Sub-bidder*—The individual or entity that submits a bid to a Bidder.

C. *Issuing Office*—The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

D. *Successful Bidder*—The lowest, qualified, responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

E. *Bidding Documents*—The Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Conditions, the Bid Form, the Contract Documents (including all Addenda issued prior to receipt of Bids), and the Technical Specifications.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 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 from The Kelley Group's online plan room at www.kelleynetworkplans.com. If a deposit is required, it will be non-refundable.

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

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

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 At the time of the bid, each bidder must submit evidence of an Alabama Licensing Board for General Contractor's license with a major classification of MU (Municipal & Utility), or another AGC Licensing Board approved classification. If the bidder has a single or multiple specialties of MU, as long as those specialties are 51% or more of the total cost of the project, the GC can bid this project.

SECTION 00 11 13
ADVERTISEMENT FOR BIDS

Sealed bids will be received by the City of Sheffield at Sheffield City Hall, located at 600 N. Montgomery Ave., Sheffield, AL 35660, until Thursday, October 8, 2026, at 1:00 P.M. CT, and then publicly opened and read aloud for furnishing all labor and materials, and performing all work described as follows:

Sanitary Sewer Lift Station Improvements

Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (existing manhole MH01 to existing wetwell) and 12" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

A non-mandatory pre-bid conference will be held virtually on Tuesday, September 29, 2026, at 1:00 P.M. CT. Instructions for attending the pre-bid conference are included in the contract specifications.

The City of Sheffield, in partnership with the Colbert County Commission, seeks to improve sanitary sewer infrastructure on the TVA Reservation to support economic development. The project is being funded by a grant from the Appalachian Regional Commission (ARC) through the Alabama Department of Economic and Community Affairs (ADECA), and the Colbert County Commission. Compliance with all applicable Federal, State, and local laws, rules, and regulations is required.

Bid documents may be purchased ONLY from The Kelley Group's online plan room at www.kelleynetworkplans.com. General contractors who bid must purchase at minimum the digital plans and specifications. Bid documents are also available at reproduction cost with no refunds available.

All bids must be on the bid form provided in the Specifications and submitted in its entirety. A cashier's check drawn on an Alabama bank or Bidder's Bond, payable to the City of Sheffield for an amount not less than five percent (5%) of the amount bid, but in no event more than ten thousand dollars, shall be filed with the bid. The bidders' bond shall be prepared on the form specified in the specifications and signed by a bonding company authorized to do business in the State of Alabama.

Performance and Labor and Material Payment Bonds, proof of insurance, verification of E-Verify enrollment, and a complete list of subcontractors and suppliers will be required prior to the signing of the Contract. A Performance Bond in an amount equal to one hundred percent (100%) of the contract costs and Labor and Material Payment Bond in an amount of one hundred percent (100%) of the contract cost in the form and terms approved by the City of Sheffield will be required at the signing of the contract. In addition, the Contractor must furnish to the City of Sheffield at the time of the signing of the contract a certificate of insurance coverage as provided in the specifications. The right is reserved to reject any and/or all bids to waive informalities and to furnish any item of material or work to change the amount of said Contract.

No bids will be considered unless the bidder, whether resident or non-resident of Alabama, is properly qualified to submit a bid for this construction in accordance with all applicable laws of the State of

Alabama. This shall include evidence of holding a current license from the State Licensing Board for General Contractors, Montgomery, Alabama, as required by Chapter 8 of Title 34 of the Code of Alabama, 1975. In addition, non-residents of the State, if a corporation, shall show evidence of having qualified with the Secretary of State to do business in the State of Alabama.

The bidder shall show evidence by clearly displaying the current license number on the outside of the sealed envelope in which the bid is delivered. In addition, bids shall be clearly identified on the exterior of the package with the bidder's name, address, the name of the project being bid, and the time and place of the bid opening. No bid may be withdrawn after the scheduled closing time for receipt of bids for a period of sixty (60) days. The Owner reserves the right to reject any or all bids and to waive technical errors if the best interest of the Owner will thereby be promoted. All bids received after the date and time of the bid opening noted above will be returned unopened.

3.02 CONTRACTOR will supply the OWNER and ENGINEER with minimum of three (3) references and validation of performing similar size and type of municipal utility construction, including lift station improvements.

3.03 To demonstrate Bidder's qualifications to perform the Work, within five days of OWNER's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be requested by the Owner. Each Bidder must submit evidence of Bidder's qualifications to do business in the State of Alabama.

3.04 According to Alabama law, "As a condition of the award of any contract, grant, or incentive by the state, any political subdivision, or any state-funded entity to a business entity or employer that employs one or more employees WITHIN THE STATE OF ALABAMA, the business or employer shall provide documentation establishing that the business or employer is enrolled in eVerify. During the performance of the contract, the business or employer shall participate in the eVerify program and shall verify every employee that is required to be verified according to the applicable federal rules and regulations." **eVerify**: https://verify.alabama.gov

3.05 At the time of bid, the bidding Contractor **MUST** provide proof of enrollment in the Alabama eVerify program and must continue to use eVerify to check employees as directed by the eVerify system. This enrollment proof is a copy of the eVerify Memorandum of Understanding (MoU) the contractor receives when registration on eVerify is finalized. The affidavit is no longer required.

3.06 Any subcontractor that works on the project **MUST** also provide to the contractor and OWNER/ENGINEER the proof of enrollment in eVerify and must also use the system to verify employees.

3.07 The contractor that the contract is awarded to **MUST** (at the time of the bid if possible, but before the contract is awarded) provide proof of active registration with the System for Award Management (SAM) website.

3.08 The contractor that the contract is awarded to **MUST** (at the time of the bid if possible, but before the contract is awarded) provide the Beason-Hammon Alabama Taxpayer and Citizen Protection Act certification form.

3.09 Any subcontractor that works on the project **MUST** also provide to the contractor and OWNER/ENGINEER the Beason-Hammon Alabama Taxpayer and Citizen Protection Act certification form.

3.10 The contractor the contract is awarded to **MUST NOT BE** listed on the Federally Debarred List.

3.11 Davis Bacon Prevailing Wage Rates for Colbert County are required.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

A. The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that the Engineer has used in preparing the Bidding Documents, if any.

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

B. Copies of reports and drawings referenced in paragraph 4.01.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.02 of the General Conditions has been identified and established in paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities, including OWNER or others. The information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site are based upon information and data furnished to the owner and Engineer by others of such Underground Facilities or others, and Owner does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary conditions.

4.03 Hazardous Environmental Condition

A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in paragraph 4.03.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.06 of the General Conditions has been identified and established in paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data,

interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 4.06 of the General Conditions.

4.05 On request, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. The bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) that relates to the Work for which a Bid is to be submitted. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Bidding Documents, including any Addenda and the other related data identified in the Bidding Documents;

B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, quantities, and Site conditions that may affect the cost, progress, and performance of the Work;

C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect the cost, progress, or performance of the Work;

D. Carefully study all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and carefully study all reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions;

E. Obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect

of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for the performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

G. Become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

I. Promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to Bidder; and

J. Determine that the Bidding Documents are generally sufficient to indicate and convey an understanding of all terms and conditions for the performance of the Work.

4.08 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 Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey an understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 **A non-mandatory pre-bid conference will be held virtually on Tuesday, September 29, 2026, at 1:00 P.M. CT via Microsoft Teams. You can join from your computer, tablet, or smartphone using this link: https://bit.ly/4xCyE6I (Meeting ID: 265 098 640 241 002 and Passcode: Kx67Jv7n). You can also dial in using your phone, (323) 433-1991 (Phone Conference ID: 652 989 479#).** The purpose of the meeting is to answer all questions the contractor may have prior to submitting his bid. Nonattendance of the pre-bid conference will not relieve the contractor from any additional stipulations discussed and or added to the project during the pre-bid meeting. Topics that cannot be covered or answered in entirety during the pre-bid will be answered afterwards by written statement. All questions should be addressed in writing to Stephen Springfield, P.E., at stephen@kelleynetwork.com, and Jessica Mandrell,

Project Manager, at jessica@kelleynetwork.com. Verbal questions and/or answers will not be binding. Unless expressly mentioned and noted for additional comment during the pre-bid conference, no additional questions will be fielded/answered prior to the bid opening.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Bidding Documents.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than *five* days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to OWNER in an amount no less than 5% of Bidder's maximum Bid price, but in no event more than ten thousand dollars ($10,000), and in the form of a certified or bank check or a Bid Bond on the form attached issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 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 seven days after the Effective Date of the Agreement or 60 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in the General Conditions and may be supplemented in the General Requirements.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to OWNER in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by OWNER. If ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, ENGINEER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, 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.

12.02 If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which OWNER or ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.

12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

12.04 The Owner and the prime contractor shall use the necessary resources to identify and directly solicit no less than 3 certified DBE/MBE firms and 3 WBE firms to bid in each expected contract/subcontract area. If a diligent and documented search of ALDOT, SBA, and MBDA directories does not identify 3 potential certified DBE/MBE firms and 3 potential certified WBE firms, then the prime contractor shall post an advertisement in at least 1 of the other online or print resources. Whenever possible, post solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date. If Prime Contractor is not utilizing subcontractors, solicitation is not necessary. A letter must be provided by prime contractor stating no subcontractors will be used within 10 days of award. **Solicitation of DBE/MBE/WBE subcontractor is required, utilization of DBE/MBE/WBE is not required.**

The documentation of these good faith DBE/MBE/WBE solicitation efforts must be detailed in order to allow for satisfactory review. Such documentation might include fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with at least 1 logged phone call.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from ENGINEER.

13.02 All blanks on the Bid Form shall be completed, and the Bid signed. Except for required signatures and initials, **all bid amounts and totals entered on the Bid Form shall be TYPED, not handwritten**. A Bid price shall be indicated for each Bid item listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

13.06 A Bid by an individual shall show the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid form. The official address of the joint venture must be shown below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

13.10 The address and telephone number for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid form.

13.12 Bids must be priced on a Unit Cost of Lump Sum basis for the base contract and include a separate price for each alternative described in the Specifications as provided for in the Bid Form.

13.13 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances named in the Contract Documents.

ARTICLE 14 - BASIS OF BID; EVALUATION OF BIDS

14.01 Unit Price

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.

C. Discrepancies between 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. Discrepancies between words and figures will be resolved in favor of the words.

14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in paragraph 11.02 of the General Conditions.

14.03 Bid prices will be compared after adjusting for differences in the time designated by Bidders for Substantial Completion. The adjusting amount will be determined at the rate set forth in the Contract Documents for liquidated damages for failing to achieve Substantial Completion for each day before or after the desired date appearing in Article 9.

ARTICLE 15 - SUBMITTAL OF BID

15.01 Each prospective Bidder is furnished (at minimum) one digital copy of the Bidding Documents. An unbound copy of the Bid Form is to be completed and submitted with the Bid security.

15.02 Contractor will supply the OWNER and ENGINEER with minimum of three (3) references and validation of performing similar size and type of municipal utility construction, including lift station improvements.

15.03 The information will be included in the Contractors bid package for review by the OWNER and ENGINEER in considering the Contractor's bid.

15.04 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, Contractor License Number and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." **A mailed Bid shall be addressed to City of Sheffield, Attention: Mayor Bryan Van Devender, 600 N. Montgomery Ave., Sheffield, AL 35660.**

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid 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 prior to the date and time for the opening of Bids.

16.02 If within 24 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 Bidder may withdraw its Bid at the discretion of OWNER, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to Bid and, unless obviously non-responsive, 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.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - AWARD OF CONTRACT

19.01 OWNER reserves the right to reject any or all Bids, including without limitation, non-conforming, non-responsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. OWNER may also 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 that Bidder. OWNER also

reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, OWNER will consider 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.

19.04 In evaluating Bidders, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.06 If the Contract is to be awarded, OWNER will award the Contract to the lowest responsive, responsible bidder whose Bid is in accordance with the Contract Documents.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to performance and payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER with the required Bonds. Within ten days thereafter, OWNER shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

SECTION 00 22 13
OWNER'S INSTRUCTIONS CONCERNING
BONDS AND INSURANCE FOR CONSTRUCTION

PROJECT:	**Sanitary Sewer Lift Station Improvements** **Project No. AL 22241-2025/24-0032A**
DESCRIPTION:	**Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (existing manhole MH01 to existing wetwell) and 12" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).**
OWNER:	**City of Sheffield** **600 N. Montgomery Ave.** **Sheffield, AL 35660**
TO: (ENGINEER)	**The Kelley Group** **800 Corporate Parkway** **Suite 100** **Birmingham, AL 35242**
ATTENTION:	**CONTRACTORS**

The following are your instructions with respect to the requirements for Bonds and insurance to be included in the Contract Documents for the above Project.

I. BONDS

A. Bid Security is to be provided by each Bidder in the amount of 5% of the bid price and will be in the form of:

1. Bid Bond; the prescribed type of Bid Bond is attached. **YES**
2. Certified or bank cashier's check drawn to the order of Owner. **YES**

B. Construction Performance Bond in an amount equal to the Contract Price and construction Payment Bond in an amount equal to the Contract Price. **YES**

II. LIABILITY INSURANCE

The limits of liability for the liability required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law or regulations and the coverage under paragraph 5.04 shall be as follows:

A. Workers' Compensation, etc. under paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:
   1. State: Statutory
   2. Applicable Federal (e.g. Longshoreman's): Statutory
   3. Employer's Liability: $500/500/500

B. Comprehensive or Commercial General Liability under paragraphs 5.04.A.3 through 5.04.A.7 of the General Conditions (including Premises-Operations; Independent Contractors' Protection; Products Liability -- Completed Operations; Broad Form Property Damage):

   1. General Aggregate (Except Products-Completed Operations) $ 2,000,000
   2. Products-Completed Operations Aggregate $ 2,000,000
   3. Personal and Advertising Injury (per Person/Organization) $ 1,000,000
   4. Each Occurrence (Bodily Injury and Property Damage) $ 1,000,000
   5. Personal Injury Liability Coverage will include Claims arising out of Employment. **NO**
   7. Exclusions of Property in Contractor's Care, Custody or Control will be eliminated. **NO**
   8. Property Damage Liability Insurance will Provide Coverage for Explosion, Collapse and Underground Damage. **YES**

C. Contractual Liability under paragraph 5.04.B.4 of the General Conditions (Bodily Injury and Property Damage).

   1. General Aggregate $ 2,000,000
   2. Each Occurrence $ 1,000,000

D. Automobile Liability under paragraph 5.04.A.6 of the General Conditions:

   1. Bodily Injury: $1,000,000 Each Person
      $1,000,000 Each Accident

   2. Property Damage: $500,000 Each Accident
      or a combined single limit of $1,000,000

E. Liability coverage for OWNER, ENGINEER, ENGINEER's Consultants and others listed in the Supplementary Conditions will be provided, subject to customary exclusions for professional liability:

   1. By endorsement as additional insureds on Contractor's Liability Policy. **YES**
   2. By a separate Protective Liability Policy covering all of them issued by CONTRACTOR's general liability carrier. (Indicate amounts of coverages $_____) **NO**

3. List here by name and address any additional individuals or entities (in addition to OWNER, ENGINEER and ENGINEER'S Consultants) to be identified in the Supplementary Conditions as insureds or additional insureds under the required liability policies: **NONE**

F. Excess Liability **YES**
   1. Umbrella Form: **YES**
   2. General Aggregate $ 2,000,000
   3. Each Occurrence $ 2,000,000

III. PROPERTY INSURANCE (BUILDER'S RISK) **APPLICABLE**

A. Property insurance to the full replacement cost of the Work (subject to deductible amount per paragraph 3.B herein) in accordance with paragraph 5.06 of the General Conditions will be provided by (select one):

   OWNER _____
   CONTRACTOR ___**X**_____

B. Such insurance will be subject to the following deductible amount $_____ in accordance with paragraph 5.06.D of the General Conditions. **(Applies only when OWNER provides Property Insurance).**

C. Boiler and machinery insurance in accordance with paragraph 5.06.B of the General Conditions will be provided by OWNER: **NO**
and will provide coverage for the following objects subject to the following limits:

   1. Objects to be insured (identify):
   2. Limits $_____.00

D. Other Property Insurance

Provided by	Type of Coverage	Amount

E. List here by name and address all individuals or entities (in addition to OWNER, CONTRACTOR, Subcontractors, ENGINEER, and ENGINEER's Consultant) to be identified in the Supplementary Conditions as insureds or additional insureds under property insurance policies: **The Kelley Group; City of Sheffield.**

BY: Bryan Van Devender DATE: 09/01/26
(OWNER)

SECTION 00 41 43
BID FORM

Project Identification: Sanitary Sewer Lift Station Improvements
Project No. AL 22241-2025/24-0032A

Project Description: Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (manhole MH01 to proposed wetwell) and 18" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

This Bid is Submitted to: City of Sheffield
600 N. Montgomery Ave.
Sheffield, AL 35660

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2.01 The Bidder declares that he understands that when quantities of Work for which unit price bids are requested are shown in the Advertisement Invitation for Bids, and in the Proposal, such quantities are approximate only and are subject to either increase or decrease, that, should the quantities of any of the Work items increase, the Bidder proposed to perform the additional Work at the unit prices bid by him, that should the quantities of any of the Work items be decreased, payment will be made only for the actual quantities of Work performed and such payment will be based upon the unit prices bid by him, and that he shall make no claim for profits anticipated on the decrease in quantities of Work. Actual quantities will be paid for as the Work progresses, in accordance with the provisions of the Contract Agreement, and such quantities shall be subject to final measurements and determinations made upon completion of the Work.

3.01 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. The Bid will remain subject to acceptance for 60 days after the Bid opening or for such a longer period of time that Bidder may agree to in writing upon request of OWNER.

4.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all of which is hereby acknowledged.

Addendum No.: _____ Addendum Date: _____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect the cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied with all federal, state, and local Laws and Regulations that may affect the cost, progress, and performance of the Work.

D. Bidder has carefully studied all the following if supplied: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of a Hazardous Environmental Condition, if any, which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

E. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for the performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.

J. The Bidding Documents are generally sufficient to indicate and convey an understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

5.01 Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity 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 individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

6.01 Except for required signatures and initials, <u>all bid amounts and totals entered on this Bid Form shall be TYPED</u>, not handwritten.

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

SANITARY SEWER LIFT STATION IMPROVEMENTS BASE BID					
Item #	**Item**	**Unit**	**Qty**	**Unit Price**	**Total Price**
1.	Mobilization/Demobilization – Including, but not limited to, Insurance, Bonds, Permits, Submittals, Existing Site Documentation, Record Drawings, Construction Layout and Staking, and Site Cleanup (Limited to 6% of the Contract Total – 4% for mobilization and 2% for demobilization)**; Furnish and Install**	LS	1		
2.	Temporary & Permanent Erosion Control; **Furnish and Install**	LS	1		
3.	Demolition of Existing Above-Ground Package Lift Station – Including Removal of Existing Fiberglass Pump Building, Concrete Pad, Discharge Piping, Control Panel, Valves, and All Associated Electrical Equipment, Wiring, and Conduit; Cutting, Capping, and Abandoning In Place the Existing 4" Discharge Force Main Upstream of the Proposed Connection; and Grout-Filling All Abandoned Pipe Penetrations**; Furnish and Install**	LS	1		
4.	Rehabilitation of Existing Wetwell – Including Furnishing and Installing New 6' Diameter Precast Wetwell Top Slab with 48" Manhole Cover for Wetwell Access**; Furnish and Install**	LS	1		
5.	Package Duplex Suction-Lift Lift Station, Complete – Including Station Enclosure with Welded Steel or Stainless Baseplate and Two-Piece Hinged Fiberglass Cover, (2) Suction-Lift Pumps with Motors; Flanged Suction and Discharge Piping, Including Check Valve, Plug Isolation Valve, Automatic Air Release Valve with Isolation Ball Valve, Gauge Panel Kit; Motor Control Panel, Complete with Variable Frequency Drives (VFDs), Primary Level Transducer and Backup Float-Based Level Control System, Surge Protective Device, Control Transformer(s), and Load Center; Startup & Testing; and All Other Appurtenances Furnished by the Pump Station Manufacturer for a Complete and Operational Lift Station, In Accordance with the Contract Documents. Wiring, Conduit, and Connection of the Motor Control Panel to the Electrical Service is Included Under the Electrical Bid Item**; Furnish and Install**	LS	1		

SANITARY SEWER LIFT STATION IMPROVEMENTS BASE BID CONTINUED					
Item #	**Item**	**Unit**	**Qty**	**Unit Price**	**Total Price**
6.	New 8'-Diameter Precast Concrete Wetwell – Including Excavation, Granular Base, Formed Invert, Wetwell Base, Vertical Risers, Gasketed Joints, Interior and Exterior Coatings, Rubber Boot Pipe Penetrations, Antivortex Flange, Suction and Discharge Piping from the Wetwell to the Package Lift Station's Flanged Suction and Discharge Connections, Sized to Match the Pump Station Manufacturer's Flanged Connections, Submersible Level Transmitter Support Piping, Bypass Suction and Discharge Piping & Appurtenances, Wetwell Access Frame & Cover, 8" Concrete Wetwell & Building Slab, and All Other Appurtenances Required for a Complete Installation**; Furnish and Install**	LS	1		
7.	Site Clearing, Grading, and 6" Thick #57 Stone with Geotextile Fabric, Including Gravel Access Drive**; Furnish and Install**	SY	298		
8.	6' Security Fence with Privacy Slats, Including Pedestrian and Vehicular Gates**; Furnish and Install**	LF	180		
9.	Electrical – Including Utility Coordination, Service Pole, Main Fused Disconnect Switch, Manual Transfer Switch with Portable Generator Receptacle, SCADA Panel & Coordination with SCADA Integrator, Site Lighting, Wiring and Connection of the Pump Station Manufacturer's Motor Control Panel to the Electrical Service, and All Associated Conduit, Wiring, and Grounding, In Accordance with the Contract Documents**; Furnish and Install**	LS	1		
10.	4" SDR21 PVC Force Main – Including Excavation, Bedding, Backfill, Trench Dewatering, Tracer Wire, Locator Tape, Pipe Restraints at All Fittings, Ductile Iron Fittings, Concrete Kickers, and All Other Appurtenances Required for a Complete Installation of the Discharge Forcemain**; Furnish and Install**	LF	116		
11.	8" Steel Casing Pipe (Open Cut Installation) with Casing Spacers and End Seals, Beneath Existing Gravel Access Road – Note: Carrier Pipe is Included in the Force Main Bid Line Item**; Furnish and Install**	LF	20		

SANITARY SEWER LIFT STATION IMPROVEMENTS BASE BID CONTINUED					
Item #	**Item**	**Unit**	**Qty**	**Unit Price**	**Total Price**
12.	10" SDR26 PVC Gravity Sewer Main, From Manhole (MH01) (by others) to Proposed Wetwell – Including Furnishing and Installing 10" SDR26 Bell & Spigot, Green, PVC Gravity Sewer Main, Excavation, Bedding, Backfill, Trench Dewatering, Tracer Wire, and Locator Tape. Connection to Manhole MH01, Including All Required Materials for a Fully Functional, Leak-Tested Connection and All Coordination with the Gravity Sewer Contractor, and Connection to the Proposed Wetwell, Including Rubber Boot Seal, Epoxy Grout, and All Required Fittings, Shall Be Subsidiary to This Item**; Furnish and Install**	LF	63		
13.	18" SDR26 PVC Gravity Sewer Main, From Existing Wetwell to New Wetwell – Including Furnishing and Installing 18" SDR26 Bell & Spigot, Green, PVC Gravity Sewer Main, Excavation, Bedding, Backfill, Trench Dewatering, Tracer Wire, and Locator Tape. Connection to the Existing Wetwell and Connection to the New Wetwell, Including Rubber Boot Seal, Epoxy Grout, and All Required Fittings, Shall Be Subsidiary to This Item**; Furnish and Install**	LF	101		
SANITARY SEWER LIFT STATION IMPROVEMENTS BASE BID TOTAL					

SANITARY SEWER LIFT STATION IMPROVEMENTS ALTERNATE BID					
Item No.	**Description**	**Unit**	**Estimated Quantity**	**Bid Unit Price**	**Bid Amount**
A-1	Frost Proof Yard Hydrant Assembly, 1,045 Linear Feet of 3/4" PEX Water Main, Open Cut, Including Tracer Wire and Locator Tape, Tapping Saddle, Corporation Stop, Curb Stop, Meter Box w/ Iron Lid, 3/4" Itron Compatible Badger Water Meter, etc. to be installed within Lift Station Site**; Furnish and Install All Required Materials**	LS	1		
SANITARY SEWER LIFT STATION IMPROVEMENTS ALTERNATE BID TOTAL					

Unit Prices have been computed in accordance with paragraph 11.03.B of the General Conditions.

8.01 Bidders are hereby notified that requirements for Build America, Buy America Act (BABA) mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States, in accordance with 2 CFR 184.

9.01 Bidder acknowledges that estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the Contract Documents. It is anticipated that air release valve item quantities will change during construction. Additional quantities installed or performed shall be presented to the ENGINEER's representative by the CONTRACTOR and confirmed by the ENGINEER in writing prior to construction activities for additional items.

A. The OWNER reserves the right, at its sole discretion, to award some, all, or none of the bid items listed in the bid form, including additive and deductive alternates, in any order, as the OWNER perceives in his best interest. CONTRACTOR reserves the right to accept award of the Contract as awarded by the OWNER. If CONTRACTOR should choose not to accept award, ENGINEER may then recommend award to next low responsive bidder or choose to recommend rejection of remaining bids.

B. The OWNER can, and will, consider options in the selection or rejection of Alternates when identifying the low responsive bidder.

10.01 Bidder agrees that the Work will be substantially complete within **120** calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07.B of the General Conditions within **150** calendar days after the date when the Contract Times commence to run.

11.01 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which shall be stated in the Agreement.

12.01 Bidder will submit with his bid package references stating his qualifications to perform the work required and provide a minimum of three (3) references and validation of performing similar size and type of municipal utility construction, including lift station improvements.

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

A. Required Bid security in an amount no less than 5% of the bid price, but in no event more than $10,000, or the form of the bid bond provided in this Project Manual; and

B. A tabulation of Subcontractors, Suppliers and other individuals and entities required to be identified in this Bid; and

C. Required bidder qualifications statement with supporting data as detailed in the Instruction to Bidders.

The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SUBMITTED on _____ _____, 20_____.

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Email:_____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Email:_____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability):_____

By: _____

(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(CORPORATE SEAL)

Attest _____

(Signature of Corporate Secretary)

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Email:_____

Date of Qualification to do business is _____.

A Joint Venture

Joint Venturer Name: _____ (SEAL)

By: _____

(Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Joint Venturer Name: _____ (SEAL)

By: _____

(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Email:_____

Phone and FAX Number, and Address for receipt of official communications:

_____

_____

SECTION 00 43 13
BID BOND

BIDDER (Name and Address):

_____
_____
_____

SURETY (Name and Address of Principal Place of Business):

_____
_____
Contact Person: _____
Email: _____
Tel. No.: _____

OWNER: **City of Sheffield**
600 N. Montgomery Ave.
Sheffield, AL 35660

BID:
BID DUE DATE: _____
PROJECT (Brief Description Including Location):

Sanitary Sewer Lift Station Improvements (Project No. AL 22241-2025/25-0053)
Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (existing manhole MH01 to existing wetwell) and 12" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

BOND:
BOND NUMBER: _____
DATE (Not later than Bid due date): _____
PENAL SUM: _____ _____
(Words) (Figures)

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER	SURETY
_____(Seal)	_____(Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: (1) Above addresses are to be used for giving required notice. (2) Any singular reference to Bidder, Surety, OWNER or other party shall be considered plural where applicable.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

   3.1 OWNER accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents, or

   3.2 All Bids are rejected by OWNER, or

   3.3 OWNER fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power or Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer or proposal as applicable.

SECTION 00 51 00
NOTICE OF AWARD

Dated: _____

TO: _____
(BIDDER)

ADDRESS: _____

OWNER: **City of Sheffield**

CONTRACT: **Sanitary Sewer Lift Station Improvements**
Project No. AL 22241-2025/24-0032A

You are notified that your Base Bid dated _____for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a Contract for the:

Sanitary Sewer Lift Station Improvements
Project No. AL 22241-2025/24-0032A

The Contract Price of your Contract is _____, (**$**_____), based on unit prices.

__3__ copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. __3__ sets of Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within 15 days of the date you receive this Notice of Award.

1. Deliver to the ENGINEER __3__ fully executed counterparts of the Contract Documents. [Each of the Contract Documents must bear your signature on page 7].

2. Deliver with the executed Contract Documents the Contract security (Bonds) as specified in the Instructions to Bidders (Article 20), and General Conditions (paragraph 5.01).

3. (List other conditions precedent).

Please provide the necessary Powers of Attorney. The Certificates of Insurance must show:

a) City of Sheffield and The Kelley Group as additional insureds.

b) City of Sheffield as Certificate Holder

c) Provisions for "Waiver of Subrogation" against the owner, engineer(s), and their consultants by the contractor, subcontractors, and their insurers.

d) Explicitly, that appropriate coverage is provided for the explosion, collapse, and underground damage.

e) Insurance cancellation notice will be given 30 days in advance, signed acknowledgment acquired, and strike out "endeavor to" and the last two lines in the cancellation block.

Please provide your insurance company with a copy of this Notice of Award with the enclosed bonds and insurance requirements documents to aid them in properly preparing their paperwork.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your Bid in default, to annul this Notice of Award, and to declare your Bid security forfeited.

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Documents.

City of Sheffield
(OWNER)

By: _____
Bryan Van Devender, Mayor

Copy to ENGINEER

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

THIS AGREEMENT is by and between the **City of Sheffield** (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

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

Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (existing manhole MH01 to existing wetwell) and 12" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Sanitary Sewer Lift Station Improvements
Project No. AL 22241-2025/24-0032A

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by:

The Kelley Group
800 Corporate Parkway
Suite 100
Birmingham, AL 35242

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 the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

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.

4.02 Days to Achieve Substantial Completion and Final Payment

A. The Work will be substantially completed within **120** calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within **150** calendar days after the date when the Contract Times commence to run.

4.03 Liquidated Damages

A. CONTRACTOR and OWNER recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expenses, 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 **$500** for each day that expires after the time specified in paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR neglects, refuses, or fails to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER **$500** for each day that expires after the time specified in paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 - CONTRACT PRICE

5.01 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraphs 5.01.A below:

A. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in this paragraph 5.01.A:

TOTAL OF ALL UNIT PRICES_____($_____)

B. As provided in paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by ENGINEER as provided in paragraph 9.08 of the General Conditions. Unit prices have been computed as provided in paragraph 11.03 of the General Conditions.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. 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.

6.02 Progress Payments; Retainage

A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment during performance of the Work as provided in paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured on the number of units completed:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER may determine or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions:

a. **95**% of Work completed (with the balance being retainage). If the Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER, on recommendation of ENGINEER, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no retainage on account of Work subsequently completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed less the aggregate of payments previously made; and

b. **95**% of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to **97.5**% of the Work completed, less such amounts as ENGINEER shall determine in accordance with paragraph 14.02.B.5 of the General Conditions and less **100**% of ENGINEER's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 Final Payment

A. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

ARTICLE 7 – INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of **5%** per annum.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

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

A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. CONTRACTOR has visited the Site and become familiar with and is satisfied with the general, local, and Site conditions that may affect the cost, progress, and performance of the Work.

C. CONTRACTOR is familiar with and is satisfied with all federal, state, and local Laws and Regulations that may affect the cost, progress, and performance of the Work.

D. CONTRACTOR has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site (if available) and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

E. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto

F. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.

H. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

I. CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents, and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 7, inclusive);
2. Performance Bond (pages 1 to 5, inclusive);
3. Payment Bond (pages 1 to 5, inclusive);
4. General Conditions (pages 1 to 58, inclusive);
5. Supplementary General Conditions (pages 1 to 3, inclusive);
6. ~~ADEM SRF Supplemental General Conditions (pages 1 to 41, inclusive);~~
7. Contract Provisions for Non-Federal Entity Contracts Under Federal Awards (pages 1 to 2, inclusive);
8. Beason-Hammon/E-Verify Certification (pages 1 to 1, inclusive);
9. Beason-Hammon Clause (page 1 to 1, inclusive);
10. Specifications as listed in the table of contents of the Project Manual;
11. Drawings as listed in the table of contents of the Project Manual and contained therein;
12. Addenda (numbers __ to __, inclusive);
13. Exhibits to this Agreement (enumerated as follows):
    a. Notice to Proceed (pages 1 to 1, inclusive);
    b. CONTRACTOR's Bid (pages __ to __, inclusive);
    c. Documentation submitted by CONTRACTOR prior to Notice of Award (pages __ to __, inclusive);

14. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

    a. Written Amendments;

    b. Work Change Directives;

    c. Change Order(s).

B. The documents listed in paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.05 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 Terms

A. Terms used in this Agreement will have the meanings indicated in the General Conditions.

10.02 Assignment of Contract

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, monies that may become due and monies 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.

10.03 Successors and Assigns

A. 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 to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 Severability

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in triplicate.

One counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or on their behalf.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER:	CONTRACTOR:
City of Sheffield	_____
By: _____	By: _____
Bryan Van Devender, Mayor	
[CORPORATE SEAL]	[CORPORATE SEAL]
Attest _____	Attest _____
Address for giving notices:	Address for giving notices:
600 N. Montgomery Ave. Sheffield, AL 35660	_____ _____ _____
Designated Representative:	Designated Representative:
Name: Bart Taft, P.E.	Name: _____
Title: Professional Engineer	Title: _____
Address: 800 Corporate Parkway, Suite 100 Birmingham, Alabama 35242	Address: _____ _____
Phone: 256-248-7030	Phone: _____
Facsimile: 1-866-225-7488	Facsimile: _____

SECTION 00 55 00
NOTICE TO PROCEED

Dated: _____

TO: _____
(BIDDER)

ADDRESS: _____

OWNER: **City of Sheffield**

CONTRACT: **Sanitary Sewer Lift Station Improvements**
Project No. AL 22241-2025/24-0032A

You are notified that the Contract Times under the above contract will commence to run on _____. By that date, you will start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is _____, and the date of readiness for final payment is _____.

Before you may start any Work at the Site, paragraph 2.05.C of the General Conditions provides that you and Owner must each deliver to the other (with copies to the Engineer and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must:

Notify the Owner and Engineer of the date that you plan to start; verify existing utilities; provide the Owner and Engineer with any agreements the Contractor has made with individuals concerning this project; and coordinate construction activities with City of Sheffield and the Engineer.

City of Sheffield
(OWNER)

By: _____
Bryan Van Devender, Mayor

Copy to ENGINEER

SECTION 00 61 13
PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

_____
_____
_____

SURETY (Name and Address of Principal Place of Business):

_____
_____
_____
Contact: _____
Tel: _____
Email: _____

OWNER: **City of Sheffield**
600 N. Montgomery Ave.
Sheffield, AL 35660

CONTRACT: **Sanitary Sewer Lift Station Improvements**
Project No. AL 22241-2025/24-0032A

Date: _____
Amount: $_____ (based on unit prices)
Description (Name and Location):

Sanitary Sewer Lift Station Improvements (Project No. AL 22241-2025/24-0032A)
Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (existing manhole MH01 to existing wetwell) and 12" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

BOND:

Date (Not earlier than Contract Date): _____
Amount: $_____
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	(Corp. Seal)	Company:	(Corp. Seal)
Signature: _____		Signature: _____	
Name and Title:		Name and Title: (Attach Power of Attorney)	

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	(Corp. Seal)	Company:	(Corp. Seal)
Signature: _____		Signature: _____	
Name and Title:		Name and Title:	

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Contract, which is incorporated herein by reference.

2. If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. If there is no OWNER Default, the Surety's obligation under this Bond shall arise after:

    3.1 The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below, that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract. If the OWNER, the CONTRACTOR and the Surety agree, the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER's right, if any, subsequently to declare a CONTRACTOR Default; and

    3.2 The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR's right to complete the Contract. Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3.1; and

    3.3 The OWNER has agreed to pay the Balance of the Contract Price to:

        3.3.1 The Surety in accordance with the terms of the Contract;

        3.3.2 Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

4. When the OWNER has satisfied the conditions of paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

    4.1 Arrange for the CONTRACTOR, with consent of the OWNER, to perform and complete the Contract; or

    4.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

    4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the contractor selected with the OWNER's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the OWNER resulting from the CONTRACTOR Default; or

    4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances;

4.4.1 After investigation, determine the amount for which it may be liable to the OWNER and, as soon as practicable after the amount is determined, tender payment therefor to the OWNER; or

4.4.2 Deny liability in whole or in part and notify the OWNER citing reasons therefor.

5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond, and the OWNER shall be entitled to enforce any remedy available to the OWNER. If the Surety proceeds as provided in paragraph 4.4, and the OWNER refuses the payment tendered or the Surety has denied pliability, in whole or in part, without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER.

6. After the OWNER has terminated the CONTRACTOR's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract. To a limit of the amount of this Bond, but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

6.1 The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract;

6.2 Additional legal, design professional and delay costs resulting from the CONTRACTOR's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and

6.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the CONTRACTOR.

7. The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the OWNER or its heirs, executors, administrators, or successors.

8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the CONTRACTOR ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

    12.1 Balance of the Contract Price: The total amount payable by the OWNER to the CONTRACTOR under the Contract after all proper adjustments have been made, including allowance to the CONTRACTOR of any amounts received or to be received by the OWNER in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled, reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract.

    12.2 Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

    12.3 CONTRACTOR Default: Failure of the CONTRACTOR, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

    12.4 OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

SECTION 00 61 14
LABOR & MATERIAL PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

_____
_____
_____

SURETY (Name and Address of Principal Place of Business):

_____
_____
_____
Contact:_____
Tel: _____
Email: _____

OWNER: **City of Sheffield**
600 N. Montgomery Ave.
Sheffield, AL 35660

CONTRACT: **Sanitary Sewer Lift Station Improvements**
Project No. AL 22241-2025/24-0032A

Date: _____
Amount: $_____(based on unit prices)
Description (Name and Location):

Sanitary Sewer Lift Station Improvements (Project No. AL 22241-2025/24-0032A)
Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (existing manhole MH01 to existing wetwell) and 12" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

BOND:
Date (Not earlier than Contract Date): _____
Amount: $_____
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	(Corp. Seal)	Company:	(Corp. Seal)
Signature: _____		Signature: _____	
Name and Title:		Name and Title: (Attach Power of Attorney)	

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	(Corp. Seal)	Company:	(Corp. Seal)
Signature: _____		Signature: _____	
Name and Title		Name and Title	

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the OWNER to pay for labor, materials and equipment furnished for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:

    2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and

    2.2. Defends, indemnifies and holds harmless the OWNER from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract, provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is no OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

    4.1. Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

    4.2. Claimants who do not have a direct contract with the CONTRACTOR:

    4.2.1. Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

    4.2.2. Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly; and

    4.2.3. Not having been paid within the above 30 days, have sent a written notice to the Surety and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.

5. If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

    6.1. Send an answer to the Claimant, with a copy to the OWNER, within 45

days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the CONTRACTOR furnishing and the OWNER accepting this Bond, they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4.1 or paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1. Claimant: An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor,

materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

15.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

15.3. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

SECTION 00 65 00
CERTIFICATION BY OWNER

I, the undersigned,_____, the duly authorized and acting official representative of the _____, do hereby certify as follows:

This contract is let in compliance with the provisions of Title 39, Code of Alabama (1975, as amended), and all other applicable provisions of law.

_____
Signature

_____
Title

_____
Date

SECTION 00 65 01
CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned,_____, the duly authorized and acting legal representative of_____, do hereby certify as follow:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

_____

Signature

_____

Date

SECTION 00 72 43
GENERAL CONDITIONS
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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

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

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

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

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

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

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

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

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

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

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

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

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications

and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

32. *PCBs*--Polychlorinated biphenyls.

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

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

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

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

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

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

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

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

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment,

systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

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

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

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

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

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

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

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

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

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

1.02 *Terminology*

A. *Intent of Certain Terms or Adjectives*

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper,"

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

B. *Day*

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

C. *Defective*

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

D. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

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

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

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

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

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds*

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to

OWNER such Bonds as CONTRACTOR may be required to furnish.

2.02 *Copies of Documents*

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

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times 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. *CONTRACTOR's Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

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

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

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

CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

2.06 *Preconstruction Conference*

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

2.07 *Initial Acceptance of Schedules*

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

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

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

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

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

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

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

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

3.02 *Reference Standards*

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

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

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

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

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

B. *Resolving Discrepancies*

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

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

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

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways: (i) a Written Amendment; (ii) a Change Order; or (iii) 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: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

3.05 *Reuse of Documents*

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

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

4.01 *Availability of Lands*

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

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

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

4.02 *Subsurface and Physical Conditions*

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

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGI

NEER has used in preparing the Contract Documents; and

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

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

1. the completeness of such reports and drawings for CONTRACTOR's purposes, 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 at or contiguous to the Site that is uncovered or revealed either:

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

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

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

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

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

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

C. *Possible Price and Times Adjustments*

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

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

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

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

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

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

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

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

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

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

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

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings

relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

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

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or

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

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

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

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

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

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in

the area affected by such condition to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

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

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

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

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

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring 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 must be accompanied by a certified copy of such agent's authority to act.

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

5.02 *Licensed Sureties and Insurers*

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

5.03 *Certificates of Insurance*

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

5.04 *CONTRACTOR's Liability Insurance*

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

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

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

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

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

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

6. claims for damages because of bodily injury or death of any person or property damage arising out of the

ownership, maintenance or use of any motor vehicle.

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

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

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

3. include completed operations insurance;

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

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

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

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

5.05 *OWNER's Liability Insurance*

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

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the

Supplementary Conditions or required by Laws and Regulations). This insurance shall:

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

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

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

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

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

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

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

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

D. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified

deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

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

5.07 *Waiver of Rights*

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

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

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

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07.B shall contain provisions to the effect

that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

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

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

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

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

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

6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

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

6.03 *Services, Materials, and Equipment*

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

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

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

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

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

6.05 *Substitutes and "Or-Equals"*

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

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

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

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

2. Substitute Items

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

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Re

quests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

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

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

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

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

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special

performance guarantee or other surety with respect to any substitute.

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

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

6.06 *Concerning Subcontractors, Suppliers, and Others*

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

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

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

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

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

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

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

6.07 *Patent Fees and Royalties*

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

6.08 *Permits*

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

owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

6.09 *Laws and Regulations*

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

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

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

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

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

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

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

equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

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

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

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

6.12 *Record Documents*

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

6.13 *Safety and Protection*

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

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or

any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

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

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

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

D. *Submittal Procedures*

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

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

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

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

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

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

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

E. *ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

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

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

F. *Resubmittal Procedures*

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

6.18 *Continuing the Work*

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

6.19 *CONTRACTOR's General Warranty and Guarantee*

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

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or

2. normal wear and tear under normal usage.

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

1. observations by ENGINEER;

2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;

4. use or occupancy of the Work or any part thereof by OWNER;

5. any acceptance by OWNER or any failure to do so;

6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

6.20 *Indemnification*

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

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

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

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

ARTICLE 7 - OTHER WORK

7.01 *Related Work at Site*

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

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

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

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

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

7.02 *Coordination*

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

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

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

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of ENGINEER*

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

8.03 *Furnish Data*

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

8.04 *Pay Promptly When Due*

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

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

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

8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on OWNER's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's

responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *OWNER'S Representative*

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

9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

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

9.03 *Project Representative*

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

9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that

should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

9.05 *Authorized Variations in Work*

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

9.06 *Rejecting Defective Work*

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

9.07 *Shop Drawings, Change Orders and Payments*

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

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

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

9.08 *Determinations for Unit Price Work*

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

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

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

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision

rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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

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

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

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

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

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

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

10.02 *Unauthorized Changes in the Work*

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

10.03 *Execution of Change Orders*

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

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

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

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

10.04 *Notification to Surety*

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

10.05 *Claims and Disputes*

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

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

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

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

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

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

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

11.01 *Cost of the Work*

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

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and

retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

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

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

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

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

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

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

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

e. Deposits lost for causes other than negligence of CONTRACTOR,

any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

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

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

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

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

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

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

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

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

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

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

equipment wrongly supplied, and making good any damage to property.

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

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

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

11.02 *Cash Allowances*

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

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

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

B. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

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

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

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

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and signifi

cantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

12.01 *Change of Contract Price*

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

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

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

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

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

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

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;

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

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under

paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

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

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

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

12.02 *Change of Contract Times*

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

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones) will be determined in accordance with the provisions of this Article 12.

12.03 *Delays Beyond CONTRACTOR's Control*

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

12.04 *Delays Within CONTRACTOR's Control*

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

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

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

12.06 *Delay Damages*

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

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

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

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

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

13.01 *Notice of Defects*

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

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

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

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

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

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

3. as otherwise specifically provided in the Contract Documents.

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

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

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

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

13.04 *Uncovering Work*

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

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

13.05 *OWNER May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

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

13.07 *Correction Period*

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

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

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

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

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or

other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.09 *OWNER May Correct Defective Work*

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

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

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

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

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the

basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

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

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

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

B. *Review of Applications*

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

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

a. the Work has progressed to the point indicated;

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

other qualifications stated in the recommendation); and

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

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

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

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

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

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

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

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

C. *Payment Becomes Due*

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

when due will be paid by OWNER to CONTRACTOR.

D. *Reduction in Payment*

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

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

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

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

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

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

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

14.03 *CONTRACTOR's Warranty of Title*

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

14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative

certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

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

14.05 *Partial Utilization*

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

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

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the

requirements of paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment*

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

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

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

B. *Review of Application and Acceptance*

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

paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

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

14.08 *Final Completion Delayed*

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

14.09 *Waiver of Claims*

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

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

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

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 OWNER May Suspend Work

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

15.02 *OWNER May Terminate for Cause*

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

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

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

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

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

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

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

15.03 *OWNER May Terminate For Convenience*

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

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

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

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

4. for reasonable expenses directly attributable to termination.

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

15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

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

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

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

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on

a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

SECTION 00 73 00
SUPPLEMENTARY GENERAL CONDITIONS

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

SC-2.02.A Copies of Documents

Delete 2.02.A and insert the following in its place: OWNER shall furnish to CONTRACTOR up to three copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

SC-2.05.B Before Starting Construction

Addition to SC-2.05B.3 to include **The Bidder acknowledges that, if awarded the Contract, a Schedule of Values will be required and must be submitted to the ENGINEER for review and approval in accordance with the Contract Documents prior to the start of submittals or construction activities. The submitted Schedule of Values must be negotiated and agreed upon by all parties before submittals and construction activities may commence.**

SC-4.04 Underground Facilities

Delete 4.04B and insert the following in its place: It is the CONTRACTOR's responsibility to contact the various utility owners and determine the exact location of ALL existing utilities on the project whether shown on the plans or not.

SC-5.04 Concerning CONTRACTORs Liability Insurance

Addition to SC-5.04B.1 to include **The CONTRACTOR will be required to include the following as additional insured: City of Sheffield; The Kelley Group.**

Add the following new paragraph immediately after paragraph 5.04.B:

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 related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:

a. State:	**Statutory**
b. Applicable Federal (e.g., Longshoreman's):	**Statutory**
c. Employer's Liability:	**$500/500/500**

2. **CONTRACTOR's General Liability under paragraphs 5.04.A.3 through 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:**

a. General Aggregate	**$2,000,000**
b. Products – Completed Operations Aggregate	**$2,000,000**
c. Personal and Advertising Injury	**$1,000,000**
d. Each Occurrence (Bodily Injury and Property Damage)	**$1,000,000**

e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.

f. Excess or Umbrella Liability

1) General Aggregate	**$2,000,000**
2) Each Occurrence	**$2,000,000**

3. **Automobile Liability under paragraph 5.04.A.6 of the General Conditions:**

a. Bodily Injury:	
Each person	**$1,000,000**
Each Accident	**$1,000,000**
b. Property Damage:	
Each Accident	**$500,000**
c. Combined Single Limit of	**$1,000,000**

4. **The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:**

a. Bodily Injury:	
Each Accident	**$1,000,000**
Annual Aggregate	**$2,000,000**
b. Property Damage:	
Each Accident	**$1,000,000**
Annual Aggregate	**$2,000,000**

5. **Additionally named insureds shall be the OWNER, the ENGINEER and their Consultants.**

6. **Liability coverage for OWNER, ENGINEER, Engineer's Consultants and other will be provided, subject to customary exclusions for professional Liability:**

   a. **By endorsement as additional insureds on CONTRACTOR's Liability Policy. YES**

7. Excess Liability:	**YES**
Umbrella Form:	**YES**
General Aggregate:	**$2,000,000**
Each Occurrence:	**$2,000,000**

SC-6.06 Concerning Subcontractors, Suppliers, and Others

Addition to SC-6.06B to include **The CONTRACTOR will be required to submit a list of Subcontractors, Suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) to the OWNER in advance of the specified date prior to the Effective Date of the Agreement. The Prime Contractor is required to have an executed contract with all subcontractors establishing scope of services and the costs associated. The contracts must be submitted for review prior to the Notice to Proceed is issued.**

SC-6.10 Taxes

Add the following new paragraph immediately after paragraph 6.10.A:

B. This project is being bid excluding taxes, and requires the CONTRACTOR comply with the requirements of Act 2013-205, which was signed into law on May 9, 2013. The CONTRACTOR and the OWNER will be required to apply for Certificates of Exemption with the Alabama Department of Revenue which will handle administration of the Certificates. The CONTRACTOR shall account for the tax savings on the Proposal Form.

SC-14.02 Progress Payments

Monthly estimates for payment shall be submitted to the office of the ENGINEER by the Friday nearest the 25th of each month. Payment amounts will be verified by the ENGINEER and then processed by the OWNER to provide payment within 10 days following approval of request. OWNER has 30 days from receipt of ENGINEER's approval to make payment. Retainage of 10% will be withheld until 50% completion of construction, and 5% retainage withheld until completion and final acceptance by the OWNER.

All monthly requests for payments must be accompanied by weekly certified payroll reports verifying the standard Davis Bacon wages rates for each employee provided in the contract specifications for Colbert County, Alabama.

Add the following new paragraph immediately after paragraph 6.12 A:

B. CONTRACTOR is required to keep all project-related records in addition to the Record Documents for three years. CONTRACTOR to provide OWNER and ENGINEER access to the records.

END OF SECTION

SECTION 00 73 02
Contract Provisions for Non-Federal Entity Contracts
Under Federal Awards

In addition to other provisions required by the Federal agency or non-Federal entity, all contracts made by the non-Federal entity under the Federal award must contain provisions covering the following, as applicable.

1.01 Contracts for more than the simplified acquisition threshold currently set at $150,000, which is the inflation-adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

1.02 All contracts in excess of $10,000 must address termination for cause and for convenience by the non-Federal entity, including the manner by which it will be affected and the basis for settlement.

1.03 Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

1.04 Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of $2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

1.05 Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible, provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions that are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market or contracts for transportation or transmission of intelligence.

1.06 Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of "funding agreement" under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

1.07 Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of $150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

1.08 Debarment and Suspension (Executive Orders 12549 and 12689)—A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

1.09 Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

SECTION 00 73 33
BEASON-HAMMON/ E-VERIFY CERTIFICATION

GENERAL:

A. Bidders hereby reminded that they are required to comply with requirements of Alabama Immigration Law, Act 2011-535 (also referred to as the "Beason-Hammon Alabama Taxpayer and Citizen Protection Act", or H.B. 658), as amended by Act No. 2012-491, including in part and effective January 1, 2012, enrollment in the E-Verify Program of the United States Department of Homeland Security:

1. Contractor's signed "E-Verify Memorandum of Understanding" will be required to be attached to any Contract awarded.

2. General Contractors and Subcontractors shall be enrolled in, participate in and maintain compliance for the duration of this contract and as otherwise required by statute.

B. The following statement shall and will be included in the Contract for Construction:

"By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the state of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom."

C. Additional information and Guidance are available at the following websites:

1. E-Verify portal maintained by the State of Alabama: http://immigration.alabama.gov

2. Alabama Office of the Attorney General Website: http://www.ago.alabama.gov/Page-Immigration

3. Alabama Building Commission: http://www.bc.state.al.us/PDFs/Bulletins/GuidanceonAct2012-491-DatedMay-29-2012.pdf

4. U.S. Department of Homeland Security, E-Verify: http://www.dhs.gov/E-Verify

State of _____
County of _____

CERTIFICATE OF COMPLIANCE WITH THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT (ACT 2011-535, as amended by ACT 2012-491)

DATE: _____

RE Contract/Grant/Incentive (describe by number or subject):
_____ by and between
_____ (Contractor/Grantee) and
_____ (State Agency, Department or Public Entity

The undersigned hereby certifies to the State of Alabama as follows:

1. The undersigned holds the position of _____ with the Contractor/Grantee named above, and is authorized to provide representations set out in this Certificate as the official and binding act of that entity, and has knowledge of the provisions of THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT (ACT 2011-535 of the Alabama Legislature, as amended by ACT 2012-491) which is described herein as "the Act."
2. Using the following definitions from Section 3 of the Act, select and initial either (a) or (b), below, to describe the Contractor/Grantee's business structure.

   BUSINESS ENTITY. Any person or group of persons employing one or more persons performing or engaging in any activity, enterprise, profession, or occupation for gain, benefit, advantage, or livelihood, whether for profit or not for profit.

   a. Self-employed individuals, business entities filing articles of incorporation, partnerships, limited partnerships, limited liability companies, foreign corporations, foreign limited partnerships, and foreign limited liability companies authorized to transact business in this state, business trusts, and any business entity that registers with the Secretary of State.

   b. Any business entity that possesses a business license, permit, certificate, approval, registration, charter, or similar form of authorization issued by the state, any business entity that is exempt by law from obtaining such a business license, and any business entity that is operating unlawfully without a business license.

   EMPLOYER. Any person, firm, corporation, partnership, joint stock association, agent, manager, representative, foreman, or other person having control or custody of any employment, place of employment, or of any employee, including any person or entity employing any person for hire within the State of Alabama, including a public employer. This term shall not include the occupant of a household contracting with another person to perform casual domestic labor within the household.

___ (a) The Contractor/Grantee is a business entity or employer, as those terms are defined in Section 3 of the Act.

___ (b) The Contractor/Grantee is not a business entity or employer, as those terms are defined in Section 3 of the Act.

3. As of the date of this Certificate, the Contractor/Grantee does not knowingly employ an unauthorized alien within the State of Alabama and hereafter, it will not knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama;
4. The Contractor/Grantee is enrolled in E-Verify unless it is not eligible to enroll because of the rules of that program or other factors beyond its control.

Certified this _____ day of _____ 20____.

_____
Name of Contractor/Grantee/Recipient

By: _____

Its _____

The above Certification was signed in my presence by the person whose name appears above, on this _____ day of _____ 20____.

WITNESS: _____

_____
Printed Name of Witness

Company ID Number:

THE E-VERIFY
MEMORANDUM OF UNDERSTANDING
FOR EMPLOYERS

ARTICLE I
PURPOSE AND AUTHORITY

The parties to this agreement are the Department of Homeland Security (DHS) and the _____ (Employer). The purpose of this agreement is to set forth terms and conditions which the Employer will follow while participating in E-Verify.

E-Verify is a program that electronically confirms an employee's eligibility to work in the United States after completion of Form I-9, Employment Eligibility Verification (Form I-9). This Memorandum of Understanding (MOU) explains certain features of the E-Verify program and describes specific responsibilities of the Employer, the Social Security Administration (SSA), and DHS.

Authority for the E-Verify program is found in Title IV, Subtitle A, of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (IIRIRA), Pub. L. 104-208, 110 Stat. 3009, as amended (8 U.S.C. § 1324a note). The Federal Acquisition Regulation (FAR) Subpart 22.18, "Employment Eligibility Verification" and Executive Order 12989, as amended, provide authority for Federal contractors and subcontractors (Federal contractor) to use E-Verify to verify the employment eligibility of certain employees working on Federal contracts.

ARTICLE II
RESPONSIBILITIES

A. RESPONSIBILITIES OF THE EMPLOYER

1. The Employer agrees to display the following notices supplied by DHS in a prominent place that is clearly visible to prospective employees and all employees who are to be verified through the system:

   a. Notice of E-Verify Participation

   b. Notice of Right to Work

2. The Employer agrees to provide to the SSA and DHS the names, titles, addresses, and telephone numbers of the Employer representatives to be contacted about E-Verify. The Employer also agrees to keep such information current by providing updated information to SSA and DHS whenever the representatives' contact information changes.

3. The Employer agrees to grant E-Verify access only to current employees who need E-Verify access. Employers must promptly terminate an employee's E-Verify access if the employer is separated from the company or no longer needs access to E-Verify.

4. The Employer agrees to become familiar with and comply with the most recent version of the E-Verify User Manual.

5. The Employer agrees that any Employer Representative who will create E-Verify cases will complete the E-Verify Tutorial before that individual creates any cases.

a. The Employer agrees that all Employer representatives will take the refresher tutorials when prompted by E-Verify in order to continue using E-Verify. Failure to complete a refresher tutorial will prevent the Employer Representative from continued use of E-Verify.

6. The Employer agrees to comply with current Form I-9 procedures, with two exceptions:

a. If an employee presents a "List B" identity document, the Employer agrees to only accept "List B" documents that contain a photo. (List B documents identified in 8 C.F.R. § 274a.2(b)(1)(B)) can be presented during the Form I-9 process to establish identity.) If an employee objects to the photo requirement for religious reasons, the Employer should contact E-Verify at 888-464-4218.

b. If an employee presents a DHS Form I-551 (Permanent Resident Card), Form I-766 (Employment Authorization Document), or U.S. Passport or Passport Card to complete Form I-9, the Employer agrees to make a photocopy of the document and to retain the photocopy with the employee's Form I-9. The Employer will use the photocopy to verify the photo and to assist DHS with its review of photo mismatches that employees contest. DHS may in the future designate other documents that activate the photo screening tool.

Note: Subject only to the exceptions noted previously in this paragraph, employees still retain the right to present any List A, or List B and List C, document(s) to complete the Form I-9.

7. The Employer agrees to record the case verification number on the employee's Form I-9 or to print the screen containing the case verification number and attach it to the employee's Form I-9.

8. The Employer agrees that, although it participates in E-Verify, the Employer has a responsibility to complete, retain, and make available for inspection Forms I-9 that relate to its employees, or from other requirements of applicable regulations or laws, including the obligation to comply with the antidiscrimination requirements of section 274B of the INA with respect to Form I-9 procedures.

a. The following modified requirements are the only exceptions to an Employer's obligation to not employ unauthorized workers and comply with the anti-discrimination provision of the INA: (1) List B identity documents must have photos, as described in paragraph 6 above; (2) When an Employer confirms the identity and employment eligibility of newly hired employee using E-Verify procedures, the Employer establishes a rebuttable presumption that it has not violated section 274A(a)(1)(A) of the Immigration and Nationality Act (INA) with respect to the hiring of that employee; (3) If the Employer receives a final nonconfirmation for an employee, but continues to employ that person, the Employer must notify DHS and the Employer is subject to a civil money penalty between $550 and $1,100 for each failure to notify DHS of continued employment following a final nonconfirmation; (4) If the Employer continues to employ an employee after receiving a final nonconfirmation, then the Employer is subject to a rebuttable presumption that it has knowingly

employed an unauthorized alien in violation of section 274A(a)(1)(A); and (5) no E-Verify participant is civilly or criminally liable under any law for any action taken in good faith based on information provided through the E-Verify.

b. DHS reserves the right to conduct Form I-9 compliance inspections, as well as any other enforcement or compliance activity authorized by law, including site visits, to ensure proper use of E-Verify.

9. The Employer is strictly prohibited from creating an E-Verify case before the employee has been hired, meaning that a firm offer of employment was extended and accepted and Form I-9 was completed. The Employer agrees to create an E-Verify case for new employees within three Employer business days after each employee has been hired (after both Sections 1 and 2 of Form I-9 have been completed), and to complete as many steps of the E-Verify process as are necessary according to the E-Verify User Manual. If E-Verify is temporarily unavailable, the three-day time period will be extended until it is again operational in order to accommodate the Employer's attempting, in good faith, to make inquiries during the period of unavailability.

10. The Employer agrees not to use E-Verify for pre-employment screening of job applicants, in support of any unlawful employment practice, or for any other use that this MOU or the E-Verify User Manual does not authorize.

11. The Employer must use E-Verify for all new employees. The Employer will not verify selectively and will not verify employees hired before the effective date of this MOU. Employers who are Federal contractors may qualify for exceptions to this requirement as described in Article II.B of this MOU.

12. The Employer agrees to follow appropriate procedures (see Article III below) regarding tentative nonconfirmations. The Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify case. The Employer agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer agrees to provide written referral instructions to employees and instruct affected employees to bring the English copy of the letter to the SSA. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending. Further, when employees contest a tentative nonconfirmation based upon a photo mismatch, the Employer must take additional steps (see Article III.B. below) to contact DHS with information necessary to resolve the challenge.

13. The Employer agrees not to take any adverse action against an employee based upon the employee's perceived employment eligibility status while SSA or DHS is processing the verification request unless the Employer obtains knowledge (as defined in 8 C.F.R. § 274a.1(l)) that the employee is not work authorized. The Employer understands that an initial inability of the SSA or DHS automated verification system to verify work authorization, a tentative nonconfirmation, a case in continuance (indicating the need for additional time for the government to resolve a case), or the finding of a photo mismatch, does not establish, and should not be interpreted as, evidence that the employee is not work authorized. In any of such cases, the employee must be provided a full and fair opportunity to contest the finding, and if he or she does so, the employee may not be terminated or suffer any adverse employment consequences based upon the employee's perceived employment eligibility status

(including denying, reducing, or extending work hours, delaying or preventing training, requiring an employee to work in poorer conditions, withholding pay, refusing to assign the employee to a Federal contract or other assignment, or otherwise assuming that he or she is unauthorized to work) until and unless secondary verification by SSA or DHS has been completed and a final nonconfirmation has been issued. If the employee does not choose to contest a tentative nonconfirmation or a photo mismatch or if a secondary verification is completed and a final nonconfirmation is issued, then the Employer can find the employee is not work authorized and terminate the employee's employment. Employers or employees with questions about a final nonconfirmation may call E-Verify at 1-888-464-4218 (customer service) or 1-888-897-7781 (worker hotline).

14. The Employer agrees to comply with Title VII of the Civil Rights Act of 1964 and section 274B of the INA as applicable by not discriminating unlawfully against any individual in hiring, firing, employment eligibility verification, or recruitment or referral practices because of his or her national origin or citizenship status, or by committing discriminatory documentary practices. The Employer understands that such illegal practices can include selective verification or use of E-Verify except as provided in part D below, or discharging or refusing to hire employees because they appear or sound "foreign" or have received tentative nonconfirmations. The Employer further understands that any violation of the immigration-related unfair employment practices provisions in section 274B of the INA could subject the Employer to civil penalties, back pay awards, and other sanctions, and violations of Title VII could subject the Employer to back pay awards, compensatory and punitive damages. Violations of either section 274B of the INA or Title VII may also lead to the termination of its participation in E-Verify. If the Employer has any questions relating to the anti-discrimination provision, it should contact OSC at 1-800-255-8155 or 1-800-237-2515 (TDD).

15. The Employer agrees that it will use the information it receives from E-Verify only to confirm the employment eligibility of employees as authorized by this MOU. The Employer agrees that it will safeguard this information, and means of access to it (such as PINS and passwords), to ensure that it is not used for any other purpose and as necessary to protect its confidentiality, including ensuring that it is not disseminated to any person other than employees of the Employer who are authorized to perform the Employer's responsibilities under this MOU, except for such dissemination as may be authorized in advance by SSA or DHS for legitimate purposes.

16. The Employer agrees to notify DHS immediately in the event of a breach of personal information. Breaches are defined as loss of control or unauthorized access to E-Verify personal data. All suspected or confirmed breaches should be reported by calling 1-888-464-4218 or via email at E-Verify@dhs.gov. Please use "Privacy Incident – Password" in the subject line of your email when sending a breach report to E-Verify.

17. The Employer acknowledges that the information it receives from SSA is governed by the Privacy Act (5 U.S.C. § 552a(i)(1) and (3)) and the Social Security Act (42 U.S.C. 1306(a)). Any person who obtains this information under false pretenses or uses it for any purpose other than as provided for in this MOU may be subject to criminal penalties.

18. The Employer agrees to cooperate with DHS and SSA in their compliance monitoring and evaluation of E-Verify, which includes permitting DHS, SSA, their contractors and other agents, upon

reasonable notice, to review Forms I-9 and other employment records and to interview it and its employees regarding the Employer's use of E-Verify, and to respond in a prompt and accurate manner to DHS requests for information relating to their participation in E-Verify.

19. The Employer shall not make any false or unauthorized claims or references about its participation in E-Verify on its website, in advertising materials, or other media. The Employer shall not describe its services as federally-approved, federally-certified, or federally-recognized, or use language with a similar intent on its website or other materials provided to the public. Entering into this MOU does not mean that E-Verify endorses or authorizes your E-Verify services and any claim to that effect is false.

20. The Employer shall not state in its website or other public documents that any language used therein has been provided or approved by DHS, USCIS or the Verification Division, without first obtaining the prior written consent of DHS.

21. The Employer agrees that E-Verify trademarks and logos may be used only under license by DHS/USCIS (see M-795 (Web)) and, other than pursuant to the specific terms of such license, may not be used in any manner that might imply that the Employer's services, products, websites, or publications are sponsored by, endorsed by, licensed by, or affiliated with DHS, USCIS, or E-Verify.

22. The Employer understands that if it uses E-Verify procedures for any purpose other than as authorized by this MOU, the Employer may be subject to appropriate legal action and termination of its participation in E-Verify according to this MOU.

B. RESPONSIBILITIES OF FEDERAL CONTRACTORS

1. If the Employer is a Federal contractor with the FAR E-Verify clause subject to the employment verification terms in Subpart 22.18 of the FAR, it will become familiar with and comply with the most current version of the E-Verify User Manual for Federal Contractors as well as the E-Verify Supplemental Guide for Federal Contractors.

2. In addition to the responsibilities of every employer outlined in this MOU, the Employer understands that if it is a Federal contractor subject to the employment verification terms in Subpart 22.18 of the FAR it must verify the employment eligibility of any "employee assigned to the contract" (as defined in FAR 22.1801). Once an employee has been verified through E-Verify by the Employer, the Employer may not create a second case for the employee through E-Verify.

a. An Employer that is not enrolled in E-Verify as a Federal contractor at the time of a contract award must enroll as a Federal contractor in the E-Verify program within 30 calendar days of contract award and, within 90 days of enrollment, begin to verify employment eligibility of new hires using E-Verify. The Employer must verify those employees who are working in the United States, whether or not they are assigned to the contract. Once the Employer begins verifying new hires, such verification of new hires must be initiated within three business days after the hire date. Once enrolled in E-Verify as a Federal contractor, the Employer must begin verification of employees assigned to the contract within 90 calendar days after the date of enrollment or within 30 days of an employee's assignment to the contract, whichever date is later.

b. Employers enrolled in E-Verify as a Federal contractor for 90 days or more at the time of a contract award must use E-Verify to begin verification of employment eligibility for new hires of the Employer who are working in the United States, whether or not assigned to the contract, within three business days after the date of hire. If the Employer is enrolled in E-Verify as a Federal contractor for 90 calendar days or less at the time of contract award, the Employer must, within 90 days of enrollment, begin to use E-Verify to initiate verification of new hires of the contractor who are working in the United States, whether or not assigned to the contract. Such verification of new hires must be initiated within three business days after the date of hire. An Employer enrolled as a Federal contractor in E-Verify must begin verification of each employee assigned to the contract within 90 calendar days after date of contract award or within 30 days after assignment to the contract, whichever is later.

c. Federal contractors that are institutions of higher education (as defined at 20 U.S.C. 1001(a)), state or local governments, governments of Federally recognized Indian tribes, or sureties performing under a takeover agreement entered into with a Federal agency under a performance bond may choose to only verify new and existing employees assigned to the Federal contract. Such Federal contractors may, however, elect to verify all new hires, and/or all existing employees hired after November 6, 1986. Employers in this category must begin verification of employees assigned to the contract within 90 calendar days after the date of enrollment or within 30 days of an employee's assignment to the contract, whichever date is later.

d. Upon enrollment, Employers who are Federal contractors may elect to verify employment eligibility of all existing employees working in the United States who were hired after November 6, 1986, instead of verifying only those employees assigned to a covered Federal contract. After enrollment, Employers must elect to verify existing staff following DHS procedures and begin E-Verify verification of all existing employees within 180 days after the election.

e. The Employer may use a previously completed Form I-9 as the basis for creating an E-Verify case for an employee assigned to a contract as long as:

i. That Form I-9 is complete (including the SSN) and complies with Article II.A.6,

ii. The employee's work authorization has not expired, and

iii. The Employer has reviewed the Form I-9 information either in person or in communications with the employee to ensure that the employee's Section 1, Form I-9 attestation has not changed (including, but not limited to, a lawful permanent resident alien having become a naturalized U.S. citizen).

f. The Employer shall complete a new Form I-9 consistent with Article II.A.6 or update the previous Form I-9 to provide the necessary information if:

i. The Employer cannot determine that Form I-9 complies with Article II.A.6,

ii. The employee's basis for work authorization as attested in Section 1 has expired or changed, or

iii. The Form I-9 contains no SSN or is otherwise incomplete.

Note: If Section 1 of Form I-9 is otherwise valid and up-to-date and the form otherwise complies with

Article II.C.5, but reflects documentation (such as a U.S. passport or Form I-551) that expired after completing Form I-9, the Employer shall not require the production of additional documentation, or use the photo screening tool described in Article II.A.5, subject to any additional or superseding instructions that may be provided on this subject in the E-Verify User Manual.

g. The Employer agrees not to require a second verification using E-Verify of any assigned employee who has previously been verified as a newly hired employee under this MOU or to authorize verification of any existing employee by any Employer that is not a Federal contractor based on this Article.

3. The Employer understands that if it is a Federal contractor, its compliance with this MOU is a performance requirement under the terms of the Federal contract or subcontract, and the Employer consents to the release of information relating to compliance with its verification responsibilities under this MOU to contracting officers or other officials authorized to review the Employer's compliance with Federal contracting requirements.

C. RESPONSIBILITIES OF SSA

1. SSA agrees to allow DHS to compare data provided by the Employer against SSA's database. SSA sends DHS confirmation that the data sent either matches or does not match the information in SSA's database.

2. SSA agrees to safeguard the information the Employer provides through E-Verify procedures. SSA also agrees to limit access to such information, as is appropriate by law, to individuals responsible for the verification of Social Security numbers or responsible for evaluation of E-Verify or such other persons or entities who may be authorized by SSA as governed by the Privacy Act (5 U.S.C. § 552a), the Social Security Act (42 U.S.C. 1306(a)), and SSA regulations (20 CFR Part 401).

3. SSA agrees to provide case results from its database within three Federal Government work days of the initial inquiry. E-Verify provides the information to the Employer.

4. SSA agrees to update SSA records as necessary if the employee who contests the SSA tentative nonconfirmation visits an SSA field office and provides the required evidence. If the employee visits an SSA field office within the eight Federal Government work days from the date of referral to SSA, SSA agrees to update SSA records, if appropriate, within the eight-day period unless SSA determines that more than eight days may be necessary. In such cases, SSA will provide additional instructions to the employee. If the employee does not visit SSA in the time allowed, E-Verify may provide a final nonconfirmation to the employer.

Note: If an Employer experiences technical problems, or has a policy question, the employer should contact E-Verify at 1-888-464-4218.

D. RESPONSIBILITIES OF DHS

1. DHS agrees to provide the Employer with selected data from DHS databases to enable the Employer to conduct, to the extent authorized by this MOU:

a. Automated verification checks on alien employees by electronic means, and

b. Photo verification checks (when available) on employees.

2. DHS agrees to assist the Employer with operational problems associated with the Employer's participation in E-Verify. DHS agrees to provide the Employer names, titles, addresses, and telephone numbers of DHS representatives to be contacted during the E-Verify process.

3. DHS agrees to provide to the Employer with access to E-Verify training materials as well as an E-Verify User Manual that contain instructions on E-Verify policies, procedures, and requirements for both SSA and DHS, including restrictions on the use of E-Verify.

4. DHS agrees to train Employers on all important changes made to E-Verify through the use of mandatory refresher tutorials and updates to the E-Verify User Manual. Even without changes to E-Verify, DHS reserves the right to require employers to take mandatory refresher tutorials.

5. DHS agrees to provide to the Employer a notice, which indicates the Employer's participation in E-Verify. DHS also agrees to provide to the Employer anti-discrimination notices issued by the Office of Special Counsel for Immigration-Related Unfair Employment Practices (OSC), Civil Rights Division, U.S. Department of Justice.

6. DHS agrees to issue each of the Employer's E-Verify users a unique user identification number and password that permits them to log in to E-Verify.

7. DHS agrees to safeguard the information the Employer provides, and to limit access to such information to individuals responsible for the verification process, for evaluation of E-Verify, or to such other persons or entities as may be authorized by applicable law. Information will be used only to verify the accuracy of Social Security numbers and employment eligibility, to enforce the INA and Federal criminal laws, and to administer Federal contracting requirements.

8. DHS agrees to provide a means of automated verification that provides (in conjunction with SSA verification procedures) confirmation or tentative nonconfirmation of employees' employment eligibility within three Federal Government work days of the initial inquiry.

9. DHS agrees to provide a means of secondary verification (including updating DHS records) for employees who contest DHS tentative nonconfirmations and photo mismatch tentative nonconfirmations. This provides final confirmation or nonconfirmation of the employees' employment eligibility within 10 Federal Government work days of the date of referral to DHS, unless DHS determines that more than 10 days may be necessary. In such cases, DHS will provide additional verification instructions.

ARTICLE III

REFERRAL OF INDIVIDUALS TO SSA AND DHS

A. REFERRAL TO SSA

1. If the Employer receives a tentative nonconfirmation issued by SSA, the Employer must print the notice as directed by E-Verify. The Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify

case. The Employer also agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer agrees to provide written referral instructions to employees and instruct affected employees to bring the English copy of the letter to the SSA. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending.

2. The Employer agrees to obtain the employee's response about whether he or she will contest the tentative nonconfirmation as soon as possible after the Employer receives the tentative nonconfirmation. Only the employee may determine whether he or she will contest the tentative nonconfirmation.

3. After a tentative nonconfirmation, the Employer will refer employees to SSA field offices only as directed by E-Verify. The Employer must record the case verification number, review the employee information submitted to E-Verify to identify any errors, and find out whether the employee contests the tentative nonconfirmation. The Employer will transmit the Social Security number, or any other corrected employee information that SSA requests, to SSA for verification again if this review indicates a need to do so.

4. The Employer will instruct the employee to visit an SSA office within eight Federal Government work days. SSA will electronically transmit the result of the referral to the Employer within 10 Federal Government work days of the referral unless it determines that more than 10 days is necessary.

5. While waiting for case results, the Employer agrees to check the E-Verify system regularly for case updates.

6. The Employer agrees not to ask the employee to obtain a printout from the Social Security Administration number database (the Numident) or other written verification of the SSN from the SSA.

B. REFERRAL TO DHS

1. If the Employer receives a tentative nonconfirmation issued by DHS, the Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify case. The Employer also agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending.

2. The Employer agrees to obtain the employee's response about whether he or she will contest the tentative nonconfirmation as soon as possible after the Employer receives the tentative nonconfirmation. Only the employee may determine whether he or she will contest the tentative nonconfirmation.

3. The Employer agrees to refer individuals to DHS only when the employee chooses to contest a tentative nonconfirmation.

4. If the employee contests a tentative nonconfirmation issued by DHS, the Employer will instruct the

employee to contact DHS through its toll-free hotline (as found on the referral letter) within eight Federal Government work days.

5. If the Employer finds a photo mismatch, the Employer must provide the photo mismatch tentative nonconfirmation notice and follow the instructions outlined in paragraph 1 of this section for tentative nonconfirmations, generally.

6. The Employer agrees that if an employee contests a tentative nonconfirmation based upon a photo mismatch, the Employer will send a copy of the employee's Form I-551, Form I-766, U.S. Passport, or passport card to DHS for review by:

a. Scanning and uploading the document, or

b. Sending a photocopy of the document by express mail (furnished and paid for by the employer).

7. The Employer understands that if it cannot determine whether there is a photo match/mismatch, the Employer must forward the employee's documentation to DHS as described in the preceding paragraph. The Employer agrees to resolve the case as specified by the DHS representative who will determine the photo match or mismatch.

8. DHS will electronically transmit the result of the referral to the Employer within 10 Federal Government work days of the referral unless it determines that more than 10 days is necessary.

9. While waiting for case results, the Employer agrees to check the E-Verify system regularly for case updates.

ARTICLE IV
SERVICE PROVISIONS

A. NO SERVICE FEES

1. SSA and DHS will not charge the Employer for verification services performed under this MOU. The Employer is responsible for providing equipment needed to make inquiries. To access E-Verify, an Employer will need a personal computer with Internet access.

ARTICLE V
MODIFICATION AND TERMINATION

A. MODIFICATION

1. This MOU is effective upon the signature of all parties and shall continue in effect for as long as the SSA and DHS operates the E-Verify program unless modified in writing by the mutual consent of all parties.

2. Any and all E-Verify system enhancements by DHS or SSA, including but not limited to E-Verify checking against additional data sources and instituting new verification policies or procedures, will be covered under this MOU and will not cause the need for a supplemental MOU that outlines these changes.

B. TERMINATION

1. The Employer may terminate this MOU and its participation in E-Verify at any time upon 30 days prior written notice to the other parties.

2. Notwithstanding Article V, part A of this MOU, DHS may terminate this MOU, and thereby the Employer's participation in E-Verify, with or without notice at any time if deemed necessary because of the requirements of law or policy, or upon a determination by SSA or DHS that there has been a breach of system integrity or security by the Employer, or a failure on the part of the Employer to comply with established E-Verify procedures and/or legal requirements. The Employer understands that if it is a Federal contractor, termination of this MOU by any party for any reason may negatively affect the performance of its contractual responsibilities. Similarly, the Employer understands that if it is in a state where E-Verify is mandatory, termination of this by any party MOU may negatively affect the Employer's business.

3. An Employer that is a Federal contractor may terminate this MOU when the Federal contract that requires its participation in E-Verify is terminated or completed. In such cases, the Federal contractor must provide written notice to DHS. If an Employer that is a Federal contractor fails to provide such notice, then that Employer will remain an E-Verify participant, will remain bound by the terms of this MOU that apply to non-Federal contractor participants, and will be required to use the E-Verify procedures to verify the employment eligibility of all newly hired employees.

4. The Employer agrees that E-Verify is not liable for any losses, financial or otherwise, if the Employer is terminated from E-Verify.

ARTICLE VI
PARTIES

A. Some or all SSA and DHS responsibilities under this MOU may be performed by contractor(s), and SSA and DHS may adjust verification responsibilities between each other as necessary. By separate agreement with DHS, SSA has agreed to perform its responsibilities as described in this MOU.

B. Nothing in this MOU is intended, or should be construed, to create any right or benefit, substantive or procedural, enforceable at law by any third party against the United States, its agencies, officers, or employees, or against the Employer, its agents, officers, or employees.

C. The Employer may not assign, directly or indirectly, whether by operation of law, change of control or merger, all or any part of its rights or obligations under this MOU without the prior written consent of DHS, which consent shall not be unreasonably withheld or delayed. Any attempt to sublicense, assign, or transfer any of the rights, duties, or obligations herein is void.

D. Each party shall be solely responsible for defending any claim or action against it arising out of or related to E-Verify or this MOU, whether civil or criminal, and for any liability wherefrom, including (but not limited to) any dispute between the Employer and any other person or entity regarding the applicability of Section 403(d) of IIRIRA to any action taken or allegedly taken by the Employer.

E. The Employer understands that its participation in E-Verify is not confidential information and may be disclosed as authorized or required by law and DHS or SSA policy, including but not limited to,

Congressional oversight, E-Verify publicity and media inquiries, determinations of compliance with Federal contractual requirements, and responses to inquiries under the Freedom of Information Act (FOIA).

F. The individuals whose signatures appear below represent that they are authorized to enter into this MOU on behalf of the Employer and DHS respectively. The Employer understands that any inaccurate statement, representation, data or other information provided to DHS may subject the Employer, its subcontractors, its employees, or its representatives to: (1) prosecution for false statements pursuant to 18 U.S.C. 1001 and/or; (2) immediate termination of its MOU and/or; (3) possible debarment or suspension.

G. The foregoing constitutes the full agreement on this subject between DHS and the Employer.

To be accepted as an E-Verify participant, you should only sign the Employer's Section of the signature page. If you have any questions, contact E-Verify at 1-888-464-4218.

Company ID Number:

Approved by:

Employer	
Name (Please Type or Print)	Title
Signature	Date
Department of Homeland Security – Verification Division	
Name (Please Type or Print)	Title
Signature	Date

Company ID Number:

Information Required for the E-Verify Program **Information relating to your Company:**	
Company Name	
Company Facility Address	
Company Alternate Address	
County or Parish	
Employer Identification Number	
North American Industry Classification Systems Code	
Parent Company	
Number of Employees	
Number of Sites Verified for	

Company ID Number:

Are you verifying for more than 1 site? If yes, please provide the number of sites verified for in each State:

Company ID Number:

Information relating to the Program Administrator(s) for your Company on policy questions or operational problems:

Company ID Number:

SECTION 00 73 36
CERTIFICATE OF COMPLIANCE WITH ACT 2016-312

DATE:_____

Re:_____ by and between

_____ (Contractor/Grantee) and _____

(State Agency, Department, or Public Entity).

The undersigned hereby certifies to the State of Alabama as follows:

1. The undersigned holds the position of _____ with the Contractor/Grantee named above, and is authorized to provide representations set out in this Certificate as the official and binding act of that entity, and has knowledge of Alabama's 2016-312.

2. In compliance with Act 2016-312, the contractor hereby certifies that it is not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade

Certified this _____ day of _____, 20_____.

_____
Name of Contractor/Grantee/Recipient

By: _____

Its: _____

The above Certification was signed in my presence by the person whose name appears above on this _____ day of _____, 20_____.

Witness: _____

_____
Printed Name of Witness

SECTION 00 73 37
BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION

Certification for Contracts, Grants, Loans, and Cooperative Agreements

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

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

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

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

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

The Contractor,_____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

_____ _____

Signature of Contractor's Authorized Official Date

_____

Name and Title of Contractor's Authorized Official

SECTION 00 73 46
DAVIS BACON WAGE RATES DETERMINATION

General Decision Number: AL20260117 05/18/2026

State: Alabama

Construction Types: Heavy

Counties: Alabama Counties of Colbert and Lauderdale

Excludes Dredging

Modification Number	Publication Date
0	01/02/2026
1	05/18/2026

CARP1209-001 01/01/2025

	Rates	Fringes
CARPENTER (INCLUDES FORM WORK)	$ 30.26	14.78

SUAL2015-045 08/02/2017

	Rates	Fringes
TRUCK DRIVER: DUMP TRUCK, INCLUDES WATER SEWER LINES	$ 12.56	2.12
OPERATOR: LOADER, INCLUDES WATER SEWER LINES	$ 17.64	2.14
OPERATOR: BACKHOE/EXCAVATOR/TRACKHOE	$ 17.18	0.00
LABORER: PIPELAYER, INCLUDES WATER SEWER LINES	$ 14.65	0.00
LABORER: COMMON OR GENERAL, INCLUDES WATER SEWER LINES	$ 13.40	3.60
ELECTRICIAN	$ 19.56	0.00
CEMENT MASON/CONCRETE FINISHER, INCLUDES WATER SEWER LINES	$ 13.71	0.00

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

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

violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.65 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract from May 11, 2026, through December 31, 2026. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

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

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than
SU, UAVG, SA, or SC denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The "SU" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

"SU" wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The "SA" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the "SA" identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

SECTION 01 11 13
SUMMARY OF WORK

PART 1 – GENERAL

1.01 CONTRACT DESCRIPTION

A. Contract Type: Unit Price as described in Agreement – EJCDC

B. The contract award, if made, will be made to the low responsive bidder. A "responsive" bid shall be evidenced by: (1) A Bid form complete in accordance with the Instructions to Bidders and with instruction and/or requests contained in any other sections of the Contract Documents; (2) A Bid Form not evidencing any apparent unbalanced pricing for performance of the Items of Work; (3) a Bid Form without excisions, special conditions or qualifications made by the Bidder; and (4) a Bid Form containing no alternative bids or offerings for any items unless such alternative bids or offerings are requested in the Technical Specifications or Contract Documents.

C. The successful bidder must furnish a Performance Bond for one hundred (100%) percent of the bid amount and a Labor and Material Payment bond for one hundred (100%) percent of the bid amount and must secure his bond from a bonding company's representative or agent in the State of Alabama.

D. The attention of bidders is called to provisions of State Law Governing General Conditions, as set forth in Chapter 4 (Section 65 to 82, inclusive) of Title 46 of the Code of Alabama of 1940, as amended; and bidders shall be governed by law insofar as it is applicable. The above-mentioned provisions of the Code make it illegal for the OWNER to consider a Bid from anyone who is not properly licensed under such code provisions. The OWNER, therefore, will not consider any bid unless the bidder produces evidence that he is so licensed. **The bidder must submit evidence of the bidder's Alabama Licensing Board for General Contractor's license with a major classification of MU (Municipal & Utility), or another AGC Licensing Board approved classification. If the bidder has a single or multiple specialty licenses, as long as those specialties are 51% or more of the total cost of the project, the GC can bid this project.**

E. Neither will the OWNER enter into a Contract with a foreign corporation which is not qualified under State Law to do business in the State of Alabama. **The CONTRACTOR must include his General CONTRACTOR's license number and classification on the outside of the sealed bid envelope.**

F. Recipients are hereby notified that requirements for Build America, Buy America Act (BABA) mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States, in accordance with 2 CFR 184. CONTRACTOR must provide Manufacturers' Certifications during Submittal review.

G. **This project is being bid excluding taxes**, and requires the CONTRACTOR comply with the requirements of Act 2013-205, which was signed into law on May 9, 2013. The

CONTRACTOR and the OWNER will be required to apply for Certificates of Exemption with the Alabama Department of Revenue which will handle administration of the Certificates. The CONTRACTOR shall account for the tax savings on the Proposal Form.

H. Unit Price

1. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

2. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.

3. Discrepancies between 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. Discrepancies between words and figures will be resolved in favor of the words.

4. Bidders acknowledge that the OWNER may award all, some, or none of the bid items listed in the Bid Form. OWNER will choose which bid items, if any, to award at their sole discretion, or at the recommendation of the ENGINEER. Successful bidder shall reserve the right to accept award of contract at their sole discretion.

1.02 WORK UNDER THIS CONTRACT

A. The CONTRACTOR shall Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (manhole MH01 (by others) to proposed wetwell) and 18" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

B. Work to be performed, including work listed and unlisted in the Contract Documents, shall be in accordance with these specifications and plans.

C. CONTRACTOR shall provide the OWNER with written notice of intent to access the project site at least five (5) business days prior to any on-site activity. This includes pre-construction site visits, all construction activities, and post-construction project walk-throughs.

D. The CONTRACTOR will notify the ENGINEER by 8 a.m. Friday of the next week's operations and promptly notify the ENGINEER of any work stoppages due to weather or other conditions preventing work, partial or complete days. The CONTRACTOR will provide the OWNER and ENGINEER with the facilities where work will occur each week and the estimated time that the facilities will be out of service, should that be required.

E. The CONTRACTOR shall annotate (mark-up) the Contract Drawings to indicate all project conditions, locations, configurations, and any other changes or deviations that vary from the original Contract Drawings. This requirement includes, but is not limited to, buried or concealed construction, and utility features that are revealed during the course of construction. Special attention shall be given to recording the locations (horizontal and vertical) and material of all buried utilities that are encountered during construction – whether or not they were indicated on the Contract Drawings.

F. These marks shall be on the plans and the ENGINEER's representative shall verify them before backfilling is permitted. Pictures of the verified mark-ups will be taken for the project record. Payment associated with this portion of work is contingent upon this verification.

G. Any below-ground utility work that is backfilled prior to the ENGINEER's representative taking photos, shall be uncovered to allow photos to be taken. Uncovering and re-backfilling shall be at no additional cost to the OWNER.

H. These annotated Contract Drawings constitute the CONTRACTOR's Record Drawings and are actual representations of as-built conditions, including all revisions made necessary by change orders, design modifications, requests for information and field orders. Record drawings shall be accessible to the OWNER and ENGINEER at all times during the construction period.

I. The CONTRACTOR shall exercise caution in working within roadways and on TVA property. Mud, dirt, or construction debris shall be removed from public roadways and TVA access roads on a daily basis or additionally as directed by local agencies or TVA personnel.

J. The CONTRACTOR shall ensure that all Occupational Safety and Health Administration (OSHA) regulations and standards are followed during all phases of the construction project. Neither the OWNER nor ENGINEER will be responsible for making the CONTRACTOR adhere to OSHA regulations and standards.

K. The CONTRACTOR will be responsible for complete coordination of the work with ALL utility companies, and be responsible for locating all underground utilities, whether shown on the plans or not. The CONTRACTOR will be responsible for performing repairs or for the cost to repair any damaged underground utilities to the complete satisfaction of the utility company involved.

L. CONTRACTOR shall furnish, install, operate, and maintain bypass pumping as necessary to maintain uninterrupted sewer service during the installation of the proposed facilities. Bypass pumping shall be considered subsidiary to the overall Contract price, and CONTRACTOR shall include the cost of all labor, equipment, and materials required for bypass pumping in his Bid; no separate payment will be made for this work.

M. CONTRACTOR shall take special care to avoid any existing utilities, both shown and not shown on the Contract Drawings, and shall hand, hydro, or air excavate at all locations

where construction of the proposed WORK is expected to cross an existing utility, excavating well ahead of reaching the expected crossing and making adjustments as needed in elevation to maintain the required separation from other utilities; at each expected crossing, CONTRACTOR shall expose the existing utility and record its depth, location, and material, and provide this information to the OWNER for record drawings prior to installing the proposed WORK.

N. Any fence, landscaping, or other structure removed temporarily to install the proposed WORK shall be promptly replaced in original or better condition at no cost to the Contract.

1.03 SUMMARY OF BID ITEMS

1. **Bid Item: Mobilization/Demobilization**

   a. This bid item shall cover CONTRACTOR's costs associated with mobilization and demobilization to the project site and shall be limited to 6% of the total bid price – 4% for mobilization and 2% for demobilization.

   b. Mobilization shall cover CONTRACTOR's cost for transportation of equipment, labor, materials, and other necessary items to the project site, as well as setup of jobsite facilities, temporary facilities, bonds, insurance, etc.

   c. This bid item shall cover CONTRACTOR's costs for any required local permitting, submittals, and existing site documentation.

   d. Demobilization shall cover CONTRACTOR's costs for removal of equipment, labor, leftover materials, etc. Demobilization shall also cover any costs associated with providing record drawings and final site cleanup.

   e. CONTRACTOR shall engage a licensed surveyor to provide construction layout and staking of the proposed lift station site and associated pipeline alignments as required to perform the proposed construction, and shall provide the survey file to ENGINEER. CONTRACTOR shall maintain all benchmark elevations, verify benchmark elevations with the surveyor prior to work commencing, and be responsible for re-establishing any lost benchmarks. Cost for construction layout and staking is subsidiary to this bid item and is not paid separately.

2. **Bid Item: Temporary & Permanent Erosion Control**

   a. CONTRACTOR shall furnish and install silt fence, inlet protection, construction entrances, and other temporary erosion and sediment control BMPs as shown in the Contract Documents ~~and required by the project's NPDES/ADEM construction stormwater permit~~, prior to commencing land-disturbing activities.

   b. CONTRACTOR shall furnish and install permanent seeding, matting, and other permanent stabilization measures within the areas disturbed by

construction, including cleanup of all disturbed areas, upon completion of the WORK.

3. **Bid Item: Demolition of Existing Above-Ground Package Lift Station**

    a. CONTRACTOR shall remove the existing fiberglass pump building, concrete pad, discharge piping, control panel, valves, and all associated electrical equipment. All wiring and conduit shall be removed from conduit runs and abandoned; the existing meter shall be turned over to the power company.

    b. CONTRACTOR shall cut, cap, and abandon in place the existing 4" discharge force main upstream of the proposed connection. Discharge piping within the existing wetwell shall be removed and the force main penetration shall be grout-filled.

    c. Any pipe penetrations at the existing wetwell not being reused, outside of the existing gravity sewer influent pipes, shall be sealed and grout-filled.

    d. CONTRACTOR shall maintain sanitary sewer service to customers served by the pump station throughout the construction period.

    e. Photos of the existing IFDC lift station may be found at the link below.

        1) https://bit.ly/4xYTGwH

4. **Bid Item: Rehabilitation of Existing Wetwell**

    a. CONTRACTOR shall furnish and install a new 6" precast wetwell top slab with 48" manhole cover on the existing wetwell for access.

    b. CONTRACTOR shall field verify all incoming gravity sewer mains to the existing wetwell and coordinate with the ENGINEER prior to construction.

5. **Bid Item: Package Duplex Suction-Lift Lift Station, Complete**

    a. CONTRACTOR shall furnish and install a factory-built, above-ground, automatic duplex suction-lift pump station, complete with station enclosure with welded steel or stainless steel baseplate and two-piece hinged fiberglass cover; two (2) suction-lift pumps with motors; flanged suction and discharge piping, including check valve, plug isolation valve, automatic air release valve with isolation ball valve, and gauge panel kit; motor control panel complete with Variable Frequency Drives (VFDs), primary level transducer and backup float-based level control system, surge protective device, control transformer(s), and load center; startup and testing; and all other appurtenances furnished by the pump station manufacturer for a complete and operational lift station, in accordance with the Contract Documents.

    b. Wiring, conduit, and connection of the motor control panel to the electrical

service shall be performed by CONTRACTOR under the Electrical bid item; furnishing of the motor control panel itself is included under this bid item.

c. Station enclosure, pump, and control panel materials of construction, performance criteria, and factory testing requirements shall be as specified in Section 33 32 16.

d. Testing, startup, and functional performance verification of the completed lift station – including the wetwell, package pump station, force main, and all associated controls and appurtenances – is included under this bid item and is not paid separately. All pumps, drives, and control systems shall be operationally tested to demonstrate that the installed equipment is electrically, mechanically, structurally, and otherwise acceptable, and conforms to the specified operating characteristics, in accordance with the Contract Documents. CONTRACTOR shall coordinate the manufacturer's start-up services; the manufacturer's technical representative shall inspect the completed installation, calibrate and adjust instrumentation, and instruct OWNER's operating personnel in proper operation and maintenance procedures.

6. **Bid Item: New 8'-Diameter Precast Concrete Wetwell**

a. CONTRACTOR shall furnish and install a new 8'-diameter precast concrete wetwell, including excavation, granular base, formed invert, wetwell base, vertical risers, gasketed joints, interior and exterior coatings, rubber boot pipe penetrations, antivortex flange, suction and discharge piping from the wetwell to the package lift station's flanged suction and discharge connections (sized to match the pump station manufacturer's flanged connections), submersible level transmitter support piping, bypass suction and discharge piping and appurtenances, wetwell access frame and cover, and all other appurtenances required for a complete installation, in accordance with the Contract Documents.

b. Pay quantity is lump sum, complete in place.

c. Level control elevations shall be as shown in the Contract Documents.

7. **Bid Item: Site Clearing, Grading, and 6" Thick #57 Stone with Geotextile Fabric, Including Gravel Access Drive**

a. CONTRACTOR shall clear, grub, and grade the existing site to provide positive drainage.

b. CONTRACTOR shall furnish and install approximately 298 SY of 6" thick #57 stone with geotextile fabric for the station site and gravel access drive, including tie-in to the existing gravel access road.

8. **Bid Item: 6' Security Fence with Privacy Slats**

a. CONTRACTOR shall furnish and install approximately 180 LF of new 6' security fence with black privacy slats, including pedestrian and vehicular gates, in accordance with the Contract Documents.

9. **Bid Item: Electrical**

a. CONTRACTOR shall coordinate with the power company for installation of a new metered 3-phase electrical service drop.

b. CONTRACTOR shall furnish and install a main fused disconnect switch (277/480V-3ø-4W, NEMA 4X stainless steel enclosure, service-entrance rated, with integrated surge protective device) and a manual transfer switch with portable generator receptacle (NEMA 4X stainless steel enclosure, with exterior Camlok-type generator inlet), along with all associated conduit, wiring, and grounding.

c. CONTRACTOR shall furnish and install a SCADA panel (120V-1ø, NEMA 4X stainless steel enclosure), along with all associated conduit and wiring, in accordance with the Contract Documents. Primary level transducer and backup float-based level control are furnished by the pump station manufacturer under the Package Duplex Suction-Lift Lift Station bid item. SCADA panel configuration, programming, communications, and all other SCADA requirements shall be determined by CONTRACTOR through direct coordination with the SCADA integrator for Sheffield Utilities. Sheffield Utilities' SCADA integrator is Electric Machine Control, Inc. (EMC); CONTRACTOR shall contact Mr. James Denton (jdenton@emcinc.com, C: 205-910-8348) to obtain SCADA panel requirements and coordinate all SCADA integration prior to equipment procurement. Cost of SCADA coordination with the integrator is subsidiary to this bid item; no separate payment will be made.

d. CONTRACTOR shall furnish and install a site light pole with LED fixture and photocell control.

e. CONTRACTOR shall wire and connect the motor control panel (furnished by the pump station manufacturer under the Package Duplex Suction-Lift Lift Station bid item) to the electrical service; furnishing of the motor control panel itself is not included under this bid item.

f. Electrical, instrumentation, and SCADA/RTU system design shown in the Contract Documents is conceptual/schematic only and is provided for bidding and coordination purposes. Final electrical design shall be the responsibility of the CONTRACTOR and shall be completed prior to equipment procurement and installation.

g. All electrical design documents shall be prepared, signed, and sealed by an engineer licensed in the State of Alabama. CONTRACTOR shall submit a

complete electrical package (single line diagram(s), panel schedules, SCADA RTU point list, and product data/shop drawings for all electrical equipment) for ENGINEER review prior to procurement.

10. **Bid Item: 4" SDR21 PVC Force Main**

    a. CONTRACTOR shall furnish and install 4" SDR21 PVC force main, including excavation, bedding, backfill, trench dewatering, tracer wire, locator tape, pipe restraints at all fittings, ductile iron fittings, and concrete kickers, and all other appurtenances required for a complete installation of the discharge force main, at the location shown on the project drawings.

    b. Payment for tracer wire and locator tape is subsidiary to the pipe.

11. **Bid Item: 8" Steel Casing Pipe (Open Cut Installation)**

    a. Casing pipe shall be 8-inch diameter steel casing, minimum wall thickness per the Contract Documents, installed by open cut method beneath the existing gravel access road at the crossing shown on the plans.

    b. Casing spacers shall be installed on the carrier pipe to ensure a minimum clearance between the carrier pipe and the inside of the casing.

    c. After installation of the carrier pipe, the ends of the casing pipe shall be sealed with flexible, 1/8-inch minimum thickness neoprene rubber end seals, secured with 1/2-inch Type 304 stainless steel bands.

    d. Carrier pipe is included in the Force Main bid line item; this bid item covers casing pipe only. Pay quantity on the Bid Form is 20 LF.

12. **Bid Item: 10" SDR26 PVC Gravity Sewer Main**

    a. CONTRACTOR shall furnish and install 10" SDR26 PVC gravity sewer main from existing manhole MH01 to the existing wetwell, including tracer wire and locator tape, at the location and grade shown on the project drawings.

    b. PVC pipe for sanitary sewer shall be green in color.

    c. Payment for tracer wire and locator tape is subsidiary to the pipe.

    d. Connection to existing manhole MH01, including all required pipe, fittings, and a watertight flexible connection (boot/coupling), and connection to the existing wetwell, including rubber boot seal, epoxy grout, and any required fittings, shall be subsidiary to this bid item.

    e. CONTRACTOR shall notify the gravity sewer CONTRACTOR and ENGINEER a minimum of two (2) days prior to making the connection at MH01, and shall field verify manhole location, invert elevation, and condition

prior to construction. Connection shall be leakage-tested per the Contract Documents.

13. **Bid Item: 18" SDR26 PVC Gravity Sewer Main**

    a. CONTRACTOR shall furnish and install 18" SDR26 PVC gravity sewer main from the existing wetwell to the new wetwell, including tracer wire and locator tape, at the location and grade shown on the project drawings.

    b. PVC pipe for sanitary sewer shall be green in color.

    c. Payment for tracer wire and locator tape is subsidiary to the pipe.

    d. Connection to the existing wetwell and connection to the new wetwell, including rubber boot seal, epoxy grout, and any required fittings, shall be subsidiary to this bid item.

14. **Alternate Bid Item: Frost Proof Yard Hydrant Assembly**

    a. CONTRACTOR shall furnish and install a frost-proof yard hydrant assembly complete with approximately 290 LF of 3/4" PEX water main, open cut, including tracer wire and locator tape, tapping saddle, corporation stop, curb stop, meter box with iron lid, and a 3/4" Itron-compatible Badger water meter, and all other appurtenances required for a complete and operational installation, in accordance with the Contract Documents.

1.04 PROJECT OBJECTIVES

A. Demolish the existing above-ground package lift station; rehabilitate the existing wetwell; furnish and install a new above-ground package duplex suction-lift lift station, complete with new 8'-diameter precast concrete wetwell, site grading and stone, 6' security fencing, electrical service, and a SCADA/instrumentation system; furnish and install 4" SDR21 PVC force main and 8" steel casing pipe (open cut); 10" SDR26 PVC gravity sewer main (existing manhole MH01 to existing wetwell) and 18" SDR26 PVC gravity sewer main (existing wetwell to new wetwell).

1.05 SERVICES AND PRODUCTS

A. OWNER's Responsibilities

1. Review shop drawings and submittal data following approval by CONTRACTOR within ten (10) days following receipt.

2. Arrange for and deliver OWNER reviewed Shop Drawings, Product Data, and Samples to CONTRACTOR.

3. Make payments on properly submitted and approved payment requests within 30 days of ENGINEER's review of the submitted invoice.

B. CONTRACTOR's Responsibilities

1. Provide detailed instructions for the construction process/timetable. Supply the OWNER and ENGINEER by 8:00 a.m. each Friday with the planned location of work for the following week. Work will not be performed on weekends, only Monday through Friday unless previously authorized by the OWNER.

2. Schedule for delivery with Suppliers; Receive and unload products at site; inspect for completeness or damage.

3. Handle, store, and install finished products in accordance with manufacturer instructions. Provide ENGINEER with written planned execution of the work including plan for the handling, storage, and installation of the supplied products.

4. Provide ENGINEER with CONTRACTOR's invoice by the Friday nearest the 25th of each month. Invoices may be submitted after the 25th of each month, however, only one invoice per month will be processed by the OWNER.

5. Attend progress meetings that will be held monthly as close to the 25th of the month as possible, or as needed, to review installations prior to submitting invoice. Approximately one week prior to invoice submittal, contact the ENGINEER's representative for review of quantities. Invoices will not be processed by the ENGINEER until quantities have been reviewed.

6. Davis Bacon wage rates are a requirement on this project. Require ALL employees associated with the project to be available for salary surveys performed on site. Interviews will be conducted approximately 10 working days after CONTRACTOR notifies OWNER and ENGINEER of the date crews will begin to work. If additional employees are brought to the site after the salary surveys have been performed, the CONTRACTOR is responsible for making arrangements to have late arriving employees interviewed by the ENGINEER at the OWNER's office. Interviews will occur again approximately two (2) weeks prior to substantial completion of work. Substantial Completion payment will not be made to the CONTRACTOR until all interviews are performed.

1.06 STORED MATERIALS

A. The quantities contained in the Proposal are approximate, and actual installed work may differ from the quantities shown. The CONTRACTOR shall be responsible for inventory control and shall take special care not to order any excess materials.

B. The OWNER will not be responsible for any stored or leftover materials ordered by the CONTRACTOR. CONTRACTOR shall submit a final invoice for materials that is identical to the quantities installed.

C. Stored materials may be listed on invoices once confirmed by the ENGINEER's representative. The CONTRACTOR will maintain insurance on any materials listed as

stored materials.

1.07 CONTRACTOR'S USE OF SITE

A. Cooperate with property owners and adjacent property owners to minimize conflict.

B. Assist OWNER with any site security issues because of construction.

1.08 WORK SEQUENCE

A. Coordinate construction schedule and operations with the OWNER and ENGINEER.

B. Provide weekly schedule updates, including changes as they occur.

1.09 LICENSES AND PERMITS

A. The CONTRACTOR shall be responsible for securing from the Local Municipalities all permits, licenses and for paying all taxes required to perform the Contract Work, if required.

B. The CONTRACTOR shall be responsible for compliance with all Federal, State and local laws and ordinances regarding licenses and permits.

1.10 PROTECTION OF THE OWNER, WORKMEN, AND THE PUBLIC

A. The CONTRACTOR is responsible for the safe execution of the work.

B. The ENGINEER and the OWNER shall not be required to act as Safety Engineers or Safety Supervisors.

C. It is the CONTRACTOR's responsibility to secure advice from the Safety officer from his insurance company.

1.11 LOCATION OF UNDERGROUND OBSTRUCTIONS

A. The CONTRACTOR shall be responsible for carefully protecting utilities and storm drains during the execution of the work.

B. Utilities that are damaged due to activities of the CONTRACTOR shall be repaired at no expense to the property OWNER.

1.12 REGULATORY REQUIREMENTS

A. Secure from the office of the Inspection Services, Division of the Public Works Department of the Local Municipalities, Information for regulatory licenses, and permits required.

B. Obtain permits and licenses from each Municipality, if required.

C. Requirements contained in each individual authority's permit shall become the provisions and requirement for completion of the work.

1.13 ROCK EXCAVATION AND DISPOSAL

A. The cost for rock excavation or removal and disposal shall be included in the overall project cost. No extra payment will be made for rock excavation, removal, or disposal.

B. "Rock" includes all materials which, in the opinion of the ENGINEER, require blasting, barring, wedging and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than one cubic yard in volume are classed as rock excavation.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 21 43
TIME ALLOWANCES

PART 1 – GENERAL

1.01 EXTENSIONS OF CONTRACT TIME

A. If the basis exists for an extension of time in accordance with the General Conditions, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

B. Reasonably anticipated days of adverse weather as set forth below shall not be cause for an extension of the Contract time unless such extension is agreed to in writing between CONTRACTOR and OWNER.

C. The CONTRACTOR shall ask for total adverse weather days. The CONTRACTOR's request shall be considered only for days over the allowable number of days stated below.

D. Contract is on a calendar day basis.

1.02 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE

A. Standard Baseline shall be regarded as the normal and anticipatable number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for an extension of Contract Time.

B. Standard Baseline is as follows:

January	**February**	**March**	**April**	**May**	**June**
11	10	8	7	5	6

July	**August**	**September**	**October**	**November**	**December**
6	5	4	3	5	8

1.03 ADVERSE WEATHER and WEATHER DELAY DAYS

A. Adverse Weather is defined as the occurrence of one or more of the following conditions which prevent exterior construction activity or access to the site within twenty-four (24) hours:

1. precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure

2. temperatures which do not rise above 32 degrees F by 10:00 a.m.

3. temperatures which do not rise above that specified for the day's construction activity by 10:00 a.m., if any is specified.

4. sustained wind in excess of twenty-five (25) m.p.h.

5. standing snow in excess of one inch (1.00")

B. Adverse Weather may include, if appropriate, "dry-out" or "mud" days:

1. for rain days above the standard baseline;

2. only if there is a hindrance to site access or site work, such as excavation, backfill, and footings; and,

3. at a rate no greater than 1 make-up day for each day or consecutive days of rain beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the ENGINEER.

4. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the CONTRACTOR's scheduled work day, including a weekend day or holiday if CONTRACTOR has scheduled construction activity that day.

1.04 DOCUMENTATION and SUBMITTALS

A. Weather Delay Report

1. Use a copy of SECTION 01 26 25 as a Weather Delay Report, indicating for each calendar month the days on which construction activity affecting the critical path of the Work was prevented by weather conditions. Mark the column for the general cause, and, under "Specifics," indicate the corresponding measurement of precipitation, temperature, wind, or other influencing factors and the construction activity that was scheduled and delayed. At the end of the month, add up the number of days delay, subtract the baseline number given in SECTION 01 21 43, and show the resulting claimable days. Submit a copy of the completed report with the next application for payment and with a subsequent claim for time extension. Claims for time extension based upon weather delays will be denied if a submitted report does not corroborate the claim or if no report was submitted when it was required in accordance with this paragraph.

B. Submit daily jobsite work logs showing which and to what extent construction activities have been affected by weather on a monthly basis.

C. Submit actual weather data to support a claim for time extension obtained from the nearest NOAA weather station or other independently verified source approved by ENGINEER at beginning of project.

D. Use Standard Baseline data provided in this Section when documenting actual delays due to weather in excess of the average climatic range.

E. Organize claims and documentation to facilitate evaluation on the basis of calendar month periods and submit in accordance with the procedures for Claims established in the General Conditions.

F. If an extension of the Contract Time is appropriate, it shall be implemented in accordance with the provisions of the General Conditions and the applicable General Requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 26 25

WEATHER DELAY REPORT

Project Number and Project Name					Month and Year reported below
Day of month	**"X" if Work delayed by this cause**				**See Section 01 21 43 for instructions for this form.**
	Precip	**Temp**	**Wind**	**Dryout**	**Specifics**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
	Total number of days this month with delay due to weather				
	Baseline number from Section 01 21 43				

	Total – Baseline = claimable days

Attach Weather Data Reports as stated in Section 01 21 43

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings.

C. Construction progress schedule.

D. Project record documents.

E. Project inspections.

F. Contract administration forms.

G. Approved Permits and Approved Construction Plans required at site.

1.02 RELATED REQUIREMENTS

A. SECTION 00 72 43 – General Conditions

B. SECTION 00 73 00 – Supplementary Conditions

C. SECTION 01 70 00 – Execution and Closeout Requirements

1.03 Administration of the Contract

A. The ENGINEER's normal working hours are from 7:30 A.M. to 5:00 P.M. Monday through Thursday and 7:30 A.M. to 11:30 A.M. on Friday.

B. The CONTRACTOR will be furnished free of charge three (3) copies of the Project Manual and will be furnished as many additional copies as he may require, at the cost of reproduction. An electronic pdf copy will also be provided.

C. Contract time shall be based on calendar days. A calendar day is one of twenty-four (24) hours beginning at 12:00 midnight.

D. The CONTRACTOR shall include verification of all necessary permits to the ENGINEER with the first payment request. A certified Release of Liens form shall be submitted with each following invoice for payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PRECONSTRUCTION MEETING

A. ENGINEER will schedule a meeting after the Notice of Award has been made, and ADECA's approval to award the project has been granted.

B. Attendance Required:

1. OWNER

2. ENGINEER.

3. CONTRACTOR.

4. SUBCONTRACTORS.

C. After notification that the contract has been executed, the ENGINEER will arrange with the OWNER and CONTRACTOR and conduct a pre-construction conference to be held at the project site. **The CONTRACTOR shall require attendance by his major Subcontractors and shall furnish to the ENGINEER and OWNER:**

1. List of Subcontractors and Material Suppliers

2. List of Material Supplies

3. Schedule of Values based on Scope of Work

4. Change Orders

5. Invoice Procedure

6. Submittals for Review

7. Submittals for Information

8. Progress Meetings

9. Pre-Close out Meeting

10. Notification of Rain Days

11. 48-hour notification before construction

D. ENGINEER shall prepare and distribute minutes.

E. Agenda:

1. Designation of personnel representing the parties to Contract, OWNER, CONTRACTOR, and ENGINEER.

2. CONTRACTOR shall furnish the following prior to his first payment and in accordance with the General Conditions within 10 days after the effective date of the agreement:

   a. Cost breakdown (Schedule of Values) shall be in standard Construction Specifications Institute format.

   b. List Subcontractors and major suppliers.

   c. Construction Schedule as defined in Paragraph 2.05 of General Conditions and Supplementary Conditions.

   d. No payments to the CONTRACTOR shall be made until this information is provided.

3. Roles of Individuals:

   a. ENGINEER – shall be solely responsible for the direction of the project. All instructions to CONTRACTOR shall come from the ENGINEER. All decisions and directions shall be in writing. Verbal instructions shall be immediately confirmed in writing.

   b. OWNER – ENGINEER to receive instructions only from OWNER. Program or design changes shall be approved by the OWNER prior to any work being performed by the ENGINEER. Establish ground rules for the CONTRACTOR and his personnel while working on OWNER's premises. If representatives of the OWNER find any discrepancies they believe to be contrary to the Contract Documents, they shall notify the ENGINEER. If it is thought that the discrepancy needs immediate attention, the individual discovering the discrepancy and the CONTRACTOR's representative should call the ENGINEER for immediate resolution. Provide staff throughout the project to make judgment calls.

   c. CONTRACTOR – Work shall be according to the Contract Documents, not necessarily standard practice. The CONTRACTOR shall keep and distribute minutes of all meetings except for the Preconstruction meeting. Emergency action to protect life or property shall be taken immediately by the superintendent on the site. Less urgent action shall be resolved by telephone among the appropriate parties.

4. Change Orders:

   a. All requests for a change in time and/or money shall be submitted to the ENGINEER, with proper backup data, for his review. The ENGINEER shall submit the Change Order to OWNER with his recommendation of action

required. The Change Order shall be approved by OWNER prior to any additional work being performed.

b. Change Orders cannot be approved without the proper breakdown as required by the General Conditions, Section 11.01. The same requirements apply to time extension requests.

c. Change Orders should be rounded to the nearest whole dollar amount.

d. User-paid change orders are not allowed.

e. User-requested change orders are to be avoided.

f. Change order documents shall be transferred between the OWNER, CONTRACTOR, and ENGINEER using the process designated in the General Conditions.

5. Invoice Procedure:

a. ENGINEER to provide acceptable invoice format to CONTRACTOR.

b. All invoices must include an original with original signatures in blue ink.

c. CONTRACTOR shall submit the original and electronic Excel file of the Certificate for Payment directly to the ENGINEER. A certificate for payment need not be notarized.

d. After review, the ENGINEER shall process the Certificates as promptly as possible, in any case, within ten (10) days. If a Certificate is held for any reason, a written notice stating the reason for delay should be given to the OWNER and the CONTRACTOR. If a Certificate is changed for any reason, changes will be made to all copies.

e. Distribution of copies shall be as follows:

1) ENGINEER forwards original directly to OWNER with a transmittal letter/memo.

2) ENGINEER forwards a copy of the transmittal letter and one (1) copy of the Certificate to CONTRACTOR. One (1) copy is retained for ENGINEER records. One (1) copy sent to OWNER.

f. If federal funds are involved, compliance with additional regulations are required, including but not limited to:

1) Davis Bacon Act - Wage rate & payroll records.

2) Drug-Free Workplace Act

3) Civil Rights EOP poster with the name of EOP person shown.

6. Prior Approval:

   a. Only items as specified or prior approved in accordance with the Contract Documents will be incorporated into the project. Approval of shop drawings does not relieve CONTRACTOR of complying with the Prior Approval clause.

7. Testing Lab:

   a. The OWNER will engage and pay for the testing laboratory if required. If the CONTRACTOR obtains the services of a testing laboratory, he will be responsible for all costs for that laboratory.

   b. ENGINEER should furnish Testing Lab with written notice of types and frequency of required tests. Set up a procedure for Testing Lab notification.

   c. No off-site testing unless called for in the Contract Documents.

   d. OWNER will pay a minimum of standby time for outside testing personnel. CONTRACTOR may be billed if not well controlled.

   e. Testing Lab invoices must be an original with the original signatures of a Lab representative and the ENGINEER on the face of the invoice.

~~8. Project Sign:~~

   a. ~~Project sign location to be agreed upon at the pre-construction meeting. Form and substance to match requirements in ADEM Supplemental General Conditions.~~

9. Meetings:

   a. Establish a time and place for the Monthly Meeting. Notify OWNER prior to and provide minutes of all other meetings.

10. General Correspondence:

   a. Project Number must be on all correspondence.

   b. CONTRACTOR shall copy OWNER on any correspondence if:

      1) It involves a controversial issue.

      2) It relates to information requests to the ENGINEER that had not been furnished in a timely manner.

11. Miscellaneous Items to be Discussed as Necessary:

    a. Outages/Interruptions of Services. CONTRACTOR is to request, in writing, all outages/interruptions to the user. The amount of advance notice is to be determined by the user. The coordination of outages or interruptions is the responsibility of the CONTRACTOR.

    b. CONTRACTOR use/access to pertinent buildings and facilities.

    c. CONTRACTOR is responsible for the disposal of all other materials in accordance with laws and regulations.

    d. Safety and First Aid. This is the CONTRACTOR's responsibility.

    e. Pictures or videos of existing conditions should be made.

12. Pre-Close Out Meeting

    a. When the project reaches 75 to 80% completion, the ENGINEER will schedule a meeting with the CONTRACTOR and the OWNER to review the requirements and procedures for the Final Inspection and Acceptance.

3.02 PROGRESS MEETINGS

A. CONTRACTOR shall schedule and administer Project Meetings as necessary for proper and timely completion of the Project. The CONTRACTOR shall:

    1. Notify OWNER, ENGINEER, and those specified to attend.

    2. Prepare agenda.

    3. Record proceedings and distribute to OWNER, ENGINEER, all attendees, and other interested parties.

B. ENGINEER will attend meetings in his capacity as the OWNER's representative to familiarize himself generally with the progress of the Work and to receive requests for interpretations necessary for the execution and the progress of the Work.

C. Representatives of the OWNER may attend meetings.

D. Progress Meetings shall be held monthly at a time agreed to by the ENGINEER prior to submitting each Request for Payment. Progress Meetings shall be held at the City or Town Hall and shall be attended by the CONTRACTOR's field and office representatives responsible for the Project and by representatives of the Subcontractors and major materials suppliers as warranted by the current status of the Work. Agenda for Progress Meetings shall be, but are not limited to, the following:

E. Agenda:

1. Review minutes of previous meetings.

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems that impede or will impede planned progress.

5. Review of RFI log, submittal log, and change order log.

6. Review off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during the succeeding work period.

10. Maintenance of quality and work standards.

11. Effect of proposed changes on progress schedule and coordination.

12. Other business relating to Work.

F. CONTRACTOR shall record minutes and distribute copies within two days after the meeting to participants, with two copies to ENGINEER, OWNER, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. **Within 14 days after the date established in Notice to Proceed, submit a preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for the remainder of Work. No Work will be allowed to proceed until the preliminary schedule has been accepted by the OWNER and ENGINEER.**

B. If the preliminary schedule requires revision after review, submit the revised schedule within 3 days.

C. **Within 7 days after a joint review of the preliminary schedule, submit a draft of the proposed complete schedule for review.**

1. Include written certification that major CONTRACTORs and Subcontractors have reviewed and accepted the proposed schedule.

D. **Submit an updated schedule with each Application for Payment.**

E. Provide projected construction schedules for the entire work; revise periodically.

F. Prepare a schedule in the form of a horizontal bar chart, with horizontal bars representing Project breakdown by various units of work. Superimpose on bar chart vertical lines representing months of the year and weeks of each month.

G. Minimum sheet size: As required to fit all information rendered in a legible manner on one (1) sheet.

H. Provide a complete sequence of construction by activity.

I. Provide sub-schedules to define critical portions of the entire schedule.

J. Update Schedule as required. Show all changes since the previous submission of the updated schedule.

K. Indicate the progress of each activity; show start and completion dates. Revise with each update.

3.04 PROJECT RECORD DOCUMENTS

A. CONTRACTOR shall maintain documents at the site, as specified in General Conditions. Store record documents apart from documents used for construction.

B. Provide files and racks for storage of documents.

1. Drawings: Maintain one (1) complete set of blueline prints of Contract Drawings.

2. CONTRACTOR to include descriptive notes and comments of any issues on one dedicated set of plans to be transmitted to the ENGINEER at the close of the project.

3.05 PROJECT INSPECTIONS

A. Where inspections of in-place work are specified, and ENGINEER's approval is required before further work can take place, or where records of procedures are specified; schedule inspection:

1. With ENGINEER.

2. Give no less than twenty-four (24) hours' notice.

B. **CONTRACTOR to notify ENGINEER and ENGINEER's Representative to schedule a quantities inspection five days prior to submitting a monthly invoice.**

C. Where inspection reveals project non-compliance, reschedule inspection by giving a further twenty-four (24) hours' notice.

3.06 CONTRACT ADMINISTRATION FORMS

A. The following forms will be provided at the pre-construction meeting:

1. Submittal Identification & CONTRACTOR's Approval Statement

2. CONTRACTOR's Application for Payment

3. American Iron & Steel (AIS) Compliance Form

4. CONTRACTOR's Release of Liens Form

5. Change Order Form

6. CONTRACTOR's Completion Certificate

B. These forms shall be used as applicable in the administration of the Contract.

3.07 APPROVED PERMITS AND APPROVED CONSTRUCTION PLANS REQUIRED AT SITE

A. CONTRACTOR shall have at the project site during construction all required permits and approved sets of plans as required by Federal, State and Local Law.

~~B. An ADEM NPDES Construction Stormwater Permit will be obtained by the OWNER and a copy provided to the awarded CONTRACTOR.~~

C. An ADEM Drinking Water Construction Permit will be obtained by the OWNER and a copy provided to the awarded CONTRACTOR.

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.01 SUMMARY

A. This section covers the requirements for establishing and updating the construction schedule(s) for the project.

1.02 SUBMITTALS

A. CONTRACTOR shall prepare a detailed construction schedule in a graphic format suitable for displaying the schedule and submit four (4) copies of each schedule to ENGINEER at the Preconstruction Conference for review and comment. ENGINEER will return one copy to CONTRACTOR with revisions suggested or necessary for coordination of the work.

1.03 FORMAT

A. The construction schedule shall show the complete work sequence by activity and location, the dates for the beginning and completion of major task items, and the projected percentage of completion for each item as of the first day of the month. At a minimum, the following items shall be shown separately:

1. Show project-specific items including, but not limited to:

a. Mobilization.

b. Meter assembly installation

c. Water main installation

d. Force main & gravity sewer main installation

e. FM01 lift station installation

B. CONTRACTOR may be required to include a critical path schedule for SHOP DRAWINGS, tests, and other submittal requirements for equipment and materials and show the delivery status of critical and major items of equipment and materials.

1.04 UPDATES

A. Construction Schedule Revisions:

1. CONTRACTOR shall submit a revised construction schedule when changes occur when requested by OWNER or ENGINEER, and with each application for partial payment. The revised construction schedule shall show changes that occurred since the

previous submission, including the actual progress of each item to date and revised projections of progress and completion.

2. CONTRACTOR shall provide a narrative report, as needed or as requested by OWNER or ENGINEER, to define anticipated problems and their effects on the schedule, recommended corrective actions, and the effect of changes on the schedules of others.

B. ENGINEER's Responsibility:

1. ENGINEER's review is only for the purpose of checking conformity with the CONTRACT DOCUMENTS.

2. ENGINEER's review does not relieve CONTRACTOR from any responsibility to determine the means, methods, techniques, sequences, and procedures of construction as provided in the CONTRACT DOCUMENTS.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Guidance for submission of Shop Drawings, Product Data, and Samples as required by Specification Sections.

1.02 Related requirements specified elsewhere:

A. SECTION 01 30 00 – Administrative Requirements

B. SECTION 01 70 00 – Execution and Closeout Requirements

C. Various Technical Sections that state-specific submittal requirements.

1.03 Prepare and submit with Construction Schedule, a separate schedule listing:

A. Dates for submission of Shop Drawings, Samples, and Product Data.

B. Dates, when approved Shop Drawings, Samples, and Product Data, will be needed for each portion of the Project.

1.04 SHOP DRAWINGS

A. Submit original drawings, prepared by the CONTRACTOR, Subcontractor, supplier, or distributor, which illustrate some portion of the Work, showing fabrication, layout, setting, or erection details. The drawings must follow the guidelines below:

B. Drawings must be prepared by a qualified detailer.

C. Drawings shall identify details by reference to the sheet and detail numbers as shown on Contract Drawings.

D. Reproducible prints made from Contract Drawings are not acceptable.

1.05 PRODUCT DATA

A. Submit, where specified, manufacturer's standard schematic drawings:

B. Modify drawings to delete information that is not applicable to Project.

C. Supplement standard information to provide additional information applicable to Project.

D. Submit, where specified, manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data.

E. Clearly mark each copy to identify pertinent materials, products, or models.

1. Show dimensions and clearances required.

2. Show performance characteristics and capacities.

3. Show wiring diagrams and controls.

1.06 SAMPLES

A. Submit, where specified, physical examples to illustrate materials, equipment, or workmanship and to establish standards against which completed work will be judged.

B. Office Samples: Where size and quantity are not specified, submit sufficient to clearly illustrate:

1. Functional characteristics of product or material, complete with integrally related parts and attachment devices.

2. Full range of color samples.

1.07 CONTRACTOR'S RESPONSIBILITIES

A. Review Shop Drawings, Product Data, and Samples in accordance with General Conditions prior to submission. Stamp and initial Shop Drawings, Product Data, and Samples to show CONTRACTOR's review prior to submission to ENGINEER for review.

1. Provide submittal review coversheet on submittal to ENGINEER to include CONTRACTOR's stamp with review status, room for ENGINEER's submittal review stamp, and, at a minimum, the following information:

a. Description of materials covered in submittal.

b. Pertinent specification section(s) for submittal.

c. Pertinent plan sheet(s) for submittal

d. Verification of review and approval of dimensions, layout, etc. in accordance with the Contract Documents.

e. A numbered system for tracking submittals issued to ENGINEER for review.

B. Verify:

1. Field Measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

C. Coordinate each submittal with requirements of work and Contract Documents.

D. CONTRACTOR's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by ENGINEER's review of submittals unless ENGINEER gives written acceptance of specific deviations.

E. Notify ENGINEER in writing at the time of submission of deviations in submittals from requirements of Contract Documents.

F. Deliver all submittals to, and collect all reviewed submittals from, the ENGINEER's Office.

G. Begin no work which requires submittals until submittals are approved.

H. After ENGINEER's review, distribute copies.

1.08 SUBMISSION REQUIREMENTS

A. Where an earlier date is not specified, schedule submissions and each resubmission to allow at least ten (10) days for ENGINEER's review.

B. Where Specifications require submittals "For Record Purposes," "For Information Only," or similar wording, submit three (3) copies of each item or one (1) electronic copy. Such submittals will not be stamped and returned by the ENGINEER.

C. Unless specified "For Record Purposes," "For Information Only," or similar wording, submittals shall be for ENGINEER's review and shall be submitted as follows:

1. Submit six (6) bond copies of Shop Drawings. Two (2) copies will be retained by the ENGINEER, and four (4) copies will be returned to the CONTRACTOR for distribution OR submit one (1) electronic copy to the ENGINEER.

2. Submit six (6) copies of Product Data; two (2) copies will be retained by ENGINEER, and four (4) copies will be returned to the CONTRACTOR for distribution OR submit one (1) electronic copy to the ENGINEER.

3. Submit Samples in the number and size specified in each Specification Section.

D. Unless previously agreed by ENGINEER and CONTRACTOR, each submission shall be complete and shall include all Shop Drawings, Product Data, and Samples necessary to fully describe each portion of the Project. Partial and incomplete submissions will not be considered.

E. Accompany submittals with a transmittal letter, in duplicate, containing:

1. Date.

2. Project title and number.

3. CONTRACTOR's name and address.

4. The number of each Shop Drawing, Product Datum, and Sample submitted.

5. Relation to adjacent structure or materials.

6. Field dimensions clearly identified as such.

7. Specifications Section Number.

8. Applicable Standards, such as ASTM Number or Federal Specification.

9. A blank space, 4" x 5", for ENGINEER's stamp.

10. Identification of deviation from Contract Documents (if any).

11. CONTRACTOR's stamp, initialed, certifying to review of submittal in accordance with 1.05 A.

1.09 RESUBMISSION REQUIREMENTS

A. Shop Drawings:

1. Revise initial Drawings as required and resubmit as specified for initial submittal.

2. Indicate in transmittal letter writing any changes which have been made other than those requested by ENGINEER.

B. Product Data and Samples: Submit new and revised Data and Samples as specified for initial submission.

1.10 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Run the required number of distribution prints from stamped and reviewed submittals. Distribute copies of Shop Drawings and Product Data which carry ENGINEER's stamp to:

1. CONTRACTOR's file

2. Job site file

3. Record Documents file

4. Subcontractors

5. Supplier/Fabricator

6. Distribute Samples as directed.

1.11 ENGINEER'S DUTIES

A. Submittals will be reviewed with reasonable promptness.

B. ENGINEER will review for:

1. Design concept of Project

2. Information given in Contract Documents

C. The ENGINEER's review will not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique or procedure of construction is indicated or required by the Contract Documents) and will not extend to safety precautions or programs incident thereto.

D. Review of a separate item shall not constitute review of an assembly in which item functions.

E. ENGINEER will affix stamp and initials verifying his review of submittal.

F. ENGINEER will return submittals to CONTRACTOR for distribution.

G. ENGINEER will not stamp and return submittals required "For Record Purpose", "For Information Only", or similar wording. Failure of the ENGINEER to respond to such submittals which may not conform to Contract requirements shall not be construed as approval of deviations from the Contract and will not relieve the CONTRACTOR from responsibility for compliance with Contract requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Locations

B. Access and Staging Area

C. Temporary utilities.

D. Temporary water and gas services.

E. Temporary Electricity Services

F. Temporary telecommunications services.

G. Temporary sanitary facilities.

H. Temporary Controls: Barriers, enclosures, fencing, and sheet piling.

I. Security requirements.

J. Fire Protection

K. Pumping and Draining

L. Vehicular access and parking.

M. Waste removal facilities and services.

N. Project identification sign.

O. Field offices.

1.02 LOCATIONS

A. Locate temporary facilities and signs in designated areas to avoid interfering with facility operations. All locations of temporary facilities must be approved by facility staff prior to the beginning of construction.

1.03 ACCESS AND STAGING AREA

A. In accordance with the general conditions of the contract, it is understood that prior to bidding, the CONTRACTOR became familiar with the conditions existing at the site and accepts the site and conditions thereupon as they are.

B. Staging Area: The CONTRACTOR and Subcontractors shall locate offices, materials storage and staging, equipment storage and maintenance areas, and similar major facilities in a staging area that does not interfere with operations required under the Contract.

1.04 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. Use trigger-operated nozzles for water hoses to avoid waste of water.

1.05 TEMPORARY WATER AND GAS SERVICES

A. It shall be the responsibility of the CONTRACTOR to determine a source of water and gas service to be used for construction purposes and to make arrangements, pay deposits, furnish and install equipment, piping, valves, outlets, and hoses to provide construction water, and gas during the construction period.

B. The CONTRACTOR shall pay all costs for water and gas service for construction purposes and shall pay all costs for water and gas used during construction until acceptance.

C. Provide cold water and paper cups for drinking by Project workers.

1.06 TEMPORARY ELECTRICITY SERVICES

A. It shall be the responsibility of the CONTRACTOR to determine a source for electric power to be used for construction purposes and to make arrangements, pay deposits, and furnish and install equipment, poles, wiring, switches, and outlets to provide an adequate supply of electricity for lighting and power during construction. Meet applicable safety requirements.

B. The CONTRACTOR shall pay all costs for providing electric service for construction purposes and shall pay for current use during construction until acceptance.

1.07 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to the field office at the time of project mobilization.

1.08 TEMPORARY SANITARY FACILITIES

A. Provide adequate temporary toilet facilities for the use of persons working at the site, as determined by the size of the workforce on site and Local Sanitary Code Requirements.

B. Maintain toilets in a clean and sanitary condition. Provide toilet tissue in a suitable holder. Provide natural or artificial light and ventilation to toilet compartments.

C. Remove temporary toilets when construction is completed and accepted.

D. Provide and maintain required facilities and enclosures. Provide at the time of project mobilization.

E. Maintain daily in a clean and sanitary condition.

F. At the end of construction, return facilities to the same or better condition as originally found.

1.09 BARRIERS

A. CONTRACTOR shall construct and maintain until construction is completed and accepted, fences, barricades, and other necessary items required to prevent injury to persons on or about the Project site, damage to property, and intrusion of unauthorized persons.

B. Provide personal safety equipment for authorized visitors.

C. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations from damage or displacement.

D. The CONTRACTOR will be responsible for maintaining access at all times during the construction of the facility.

E. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for OWNER'S use of the site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

F. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings.

G. Provide protection for plants designated to remain. Replace damaged plants.

H. Protect non-owned vehicular traffic, stored materials, sites, and structures from damage.

I. Traffic Controls: CONTRACTOR shall provide a traffic control plan as needed.

1.10 FENCING

A. Construction: CONTRACTOR to provide gated access to the work site and remove at the completion of the project.

1.11 SHEET PILING

A. In addition to the work specified, provide sheet piling, should such be found necessary. All sheet pile designs must be signed by a licensed ENGINEER in the state where the

work is being done.

B. Type, thickness, shoring, bracing and other details in regard to sheet piling shall be CONTRACTOR's sole responsibility and shall be determined by him as necessitated by excavation depth, soil conditions, rainfall, traffic adjacent to site and other related factors.

1.12 SECURITY

A. Coordinate with OWNER to ensure premises remains secure during construction.

1.13 FIRE PROTECTION

A. Provide general temporary fire protection during the construction period.

B. Have immediately available suitable fire extinguishers in areas where welding, flame cutting, and other hazardous operations are underway.

1.14 PUMPING AND DRAINING

A. Keep working and storage areas free from water that could damage or that could interfere with the progress of work.

B. Slope ground to drain surface water away from excavations and structures.

C. Pump or drain to designated points as determined by the ENGINEER. Distribute discharge to prevent excessive erosion. Replace eroded materials.

1.15 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to the use of streets and sidewalks, access to emergency facilities, and access to emergency vehicles. Load all trucks bringing materials to the site or removing earth and debris from the site in a manner to prevent dropping materials, earth, or debris on public streets, roads, and highways.

B. Coordinate access and haul routes with governing authorities and OWNER. Confirm all local regulations regarding load limits.

C. Provide and maintain access to fire hydrants free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets. Maintain an installation at all points where and when trucks enter or leave the site to remove materials, mud, or debris immediately from streets, roads, and highways.

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

G. Do not allow vehicle parking on existing pavement.

1.16 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site Daily.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

E. Remove temporary work when need for its use has passed.

F. Clean area that was occupied by temporary work. Remove debris, rubbish and excess materials from site on a daily basis.

1.17 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on Drawings.

B. Erect on site at location indicated.

C. Signs, as necessary for safety and to meet insurance requirements will be required.

D. No other signs are allowed without OWNER permission except those required by law.

1.18 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

D. For exterior storage, provide suitable and sufficient enclosed covered structures with raised flooring, to protect materials and equipment subject to damage by weather or construction work.

E. Provide weatherproof coverage for materials and equipment needing only limited protection.

F. Allocate and designate storage areas and workspaces for various trades.

G. Arrange temporary buildings and designate storage spaces to avoid interfering with operations, to avoid re-handling and to expedite progress of work.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 51 36
PUMP STATION FLOW CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. This section addresses the work related to the control of sewage flow. The CONTRACTOR shall furnish all labor, materials, equipment, and supplies and shall perform all work related to the control of sewage flow. Flow control and routing methods shall be subject to review by the ENGINEER prior to work commencing on each portion of the system.

1.02 SUBMITTALS

A. Submit shop drawings and manufacturer's data in accordance with the provisions of SECTION 01 33 00 – Submittal Procedures.

B. **The CONTRACTOR shall submit flow control and sewage bypassing arrangement plans to the ENGINEER for review and approval at least 7 days prior to commencing work on each portion of the system.** Flow control includes, but is not limited to, plugging and bypass pumping or hauling as appropriate for the work to be performed. The plans must be specific and complete, and shall include, but not be limited to, the following details:

1. Capacities of equipment.
2. Number and types of pumps:
    a. Two minimum
    b. Lead pump to be electric motor powered
    c. Lag pump to be diesel engine powered
3. Road crossing details.
4. Protection against pipe breaks.
5. Sewer plugging methods and bypass time duration.
6. Size, length, material, and method of installation for suction and discharge piping.
7. Method of noise control for each pump and/or generator.
8. Locations of bypass equipment, suction intake, and pump discharge.
9. Alarm system with monitoring and response plan.
10. List of emergency CONTRACTOR contact phone numbers.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 FLOW CONTROL

A. Bypassed flows must be discharged to the sanitary sewer system, appropriate watertight vehicle or appropriate watertight container.

B. Flows shall be diverted, hauled, or otherwise handled to prevent flows from interfering with the work to be performed on that portion of the system.

C. When pumping/bypassing is required, the CONTRACTOR shall supply the necessary pumps, conduits, engines, and other equipment to divert the flow of sewage as appropriate. The CONTRACTOR shall have backup equipment available should the primary system fail. The pumping/bypass system shall be adequate in size to handle the existing peak use flows and additional flows that occur with rainstorms.

D. The CONTRACTOR shall furnish the labor and supervision to set up, operate, and maintain the pumping/bypass system.

E. The CONTRACTOR shall select pumping/bypass equipment that will not have noise levels above sixty decibels (60 db) at a distance of 50 feet (50').

3.02 FLOW CONTROL PRECAUTIONS

A. When the flow in a sewer line is plugged, blocked, or bypassed, the CONTRACTOR shall take precautions to protect public health and to protect the sewer lines from damage that might result from sewer surcharging. Further, the CONTRACTOR shall take precautions to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. The CONTRACTOR shall be responsible for any damage resulting from his flow control operations.

B. When the flow in a sewer line is plugged or blocked, the CONTRACTOR shall monitor the conditions upstream of the plug and shall be prepared to immediately start bypass pumping, if needed. No such liquid or solid matter shall be allowed to be discharged, stored, or deposited on the ground, swale, road, stormwater drainage system, or other open environment. The CONTRACTOR shall protect all pumps, conduits, and other equipment used for bypass from traffic.

C. Should any liquid or solid matter from the sewer collection system be spilled, discharged, leaked, or otherwise deposited to the open environment as a result of the CONTRACTOR'S flow control operations, the CONTRACTOR shall immediately clean up and disinfect the affected area and assume all costs associated herewith. The CONTRACTOR shall also notify the OWNER and appropriate regulatory agencies.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This section addresses the requirements for submittal of shop drawings and the delivery of equipment and materials required for construction of the project.

B. Related Sections: All

1.02 SUBMITTALS

A. Submit shop drawing submittal schedule prior to first submittal of any shop drawing or CONTRACTOR'S first Application for Payment.

1.03 MATERIALS AND EQUIPMENT

A. For the purpose of standardization, equipment of any one type shall be the products of one manufacturer.

B. Do not use secondhand or salvaged materials and equipment whether removed from existing premises or from another source, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer for components being replaced.

D. Materials and equipment shall be selected from those listed in the specifications or ENGINEER approved equal.

1.04 TRANSPORTATION AND HANDLING

A. Transport and handle materials and equipment in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that materials and equipment comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle materials and equipment by methods that will prevent soiling, disfigurement, or damage.

1.05 STORAGE AND PROTECTION

A. Store and protect materials and equipment in accordance with manufacturer's instructions.

B. Store with seals and labels intact and legible.

C. Store weather sensitive materials and equipment in weather-tight, climate-controlled enclosures in an environment favorable to the product.

D. For exterior storage of fabricated materials and equipment, place on sloped supports above ground.

E. Cover materials and equipment subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of materials and equipment.

F. Store loose granular materials on solid, flat surfaces in a well-drained area. Prevent mixing with foreign matter.

G. Provide equipment and personnel to store materials and equipment by methods that will prevent soiling, disfigurement, or damage.

H. Arrange storage of materials and equipment to permit access for inspection. Periodically inspect to verify that products are undamaged and are being maintained in acceptable condition.

I. Provide lubricants and perform initial lubrication and all subsequent lubrication until the project is approved and accepted by the ENGINEER. Lubricants and lubrication shall be in accordance with equipment manufacturer's instructions.

J. Limit size and maintain stockpiles of construction materials in a manner that will not block existing drainage or be hazardous to pedestrian or vehicular traffic in any way. This limitation, relative to the stockpiling of construction materials, shall be controlled by OWNER. In the event CONTRACTOR fails to satisfactorily modify his operations relative to the stockpiling of construction materials upon order of OWNER, all Work except clean-up operations will be stopped, and remain stopped, until the order of OWNER has been complied with.

K. Do not place stored materials within the drip line of trees.

1.06 MATERIALS AND EQUIPMENT OPTIONS

A. Materials and equipment specified by reference standards or by description only: Any material or equipment meeting those standards or description.

B. Materials and equipment specified by naming one or more manufacturers: Materials and equipment of manufacturers named and meeting Specifications, no options or substitutions allowed.

C. Materials and equipment specified by naming one or more manufacturers with a provision for or approved equal: Submit a request for consideration of any manufacturer not named in accordance with the following Article.

1.07 SUBSTITUTES AND "OR APPROVED EQUAL" ITEMS

A. OWNER will consider requests for substitute and "or-approved equal" items.

1.08 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1. Submit within 15 days after date of Agreement.

2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.09 MANUFACTURER'S INSTRUCTIONS

A. Install work in compliance with Manufacturer's printed instructions unless conflicting requirements are specified. Obtain and distribute copies of such instructions to parties involved in the installation, including two (2) copies to the ENGINEER for information only.

1. Maintain one (1) set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with Manufacturer's instructions, consult with ENGINEER for further instructions.

2. Do not proceed with work without clear instructions.

C. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

PART 2 – PRODUCTS

2.01 EXISTING PRODUCTS

A. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Do not use products having any of the following characteristics:

2.03 PRODUCT OPTIONS

A. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

B. At the pre-construction conference, submit a complete list of major products proposed to be used, with the name of the Manufacturer and the installing Subcontractor.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment

PART 3 – EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall provide material and equipment submittals in advance of scheduled installation to allow for review and approval by the ENGINEER in accordance with the General Conditions.

B. Illegible submittals will be returned to the CONTRACTOR without comment.

C. Verbal approval by the OWNER or the ENGINEER of material and equipment proposed by the CONTRACTOR for incorporation into the work will have no standing.

D. The CONTRACTOR shall not bring unapproved material or equipment onto the project site.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of OWNER personnel.

I. Closeout procedures, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. SECTION 01 33 00 – Submittal Procedures.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.04 SUBMITTALS

A. See SECTION 01 33 00 – Submittal Procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.

2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.

3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.

2. Identify demolition firm and submit qualifications.

3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to ENGINEER. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by OWNER.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1. Minimize amount of bare soil exposed at one time.

2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

5. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

6. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

7. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

8. Pollution Control: 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. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After OWNER occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of OWNER's activities.

PART 2 – PRODUCTS

2.01 MATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in SECTION 01 60 00 – Product Requirements.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify ENGINEER four days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of examination, preparation, and installation procedures.

2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to ENGINEER, OWNER, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify ENGINEER of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to ENGINEER the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to ENGINEER.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines, and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.

2. Grid or axis for structures.

3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to ENGINEER before disturbing existing installation.

3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.

C. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.

2. Relocate items indicated on drawings.

3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.

4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications: Remove, relocate, and extend existing systems to accommodate new construction.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow

access or provide access panel.

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.

3. Where existing active systems serve occupied facilities, but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

    a. Disable existing systems only to make switchovers and connections; minimize duration of outages.

    b. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.

5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

E. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:

1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.

2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:

1. Complete the work.

2. Fit products together to integrate with other work.

3. Provide openings for penetration of mechanical, electrical, and other services.

4. Match work that has been cut to adjacent work.

5. Repair areas adjacent to cuts to required condition.

6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.

8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.

J. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site daily and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify ENGINEER and OWNER seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable CONTRACTOR personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to OWNER's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of OWNER personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with OWNER's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains, and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. See General Conditions and Supplementary General Conditions for requirements of Substantial Completion and Final Acceptance.

B. Make submittals that are required by governing or other authorities.

1. Provide copies to ENGINEER and OWNER.

C. Notify ENGINEER when work is considered ready for Substantial Completion.

D. Punch List

1. When the Project nears completion, the CONTRACTOR shall prepare a list of items to be completed or corrected. This list shall be submitted to the ENGINEER for his review, verification, and amendment. Incorporate all uncorrected items included on observation reports made by ENGINEER's representative. Submit certificates of inspection from all responsible Regulatory Agencies concurrently with Punch List.

2. All Punch List items shall be completed prior to release of Retainage specified in Supplementary Conditions or elsewhere in the contract documents. No intermediate request for payment will be considered by the ENGINEER for Punch List items.

E. 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.

F. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to owner-occupied areas.

G. Notify ENGINEER when work is considered finally complete.

H. Complete items of work determined by ENGINEER's final inspection.

I. Submit project record documents to the ENGINEER upon completion of the punch list.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the OWNER.

END OF SECTION

SECTION 01 73 19
EQUIPMENT INSTALLATION

PART 1 – GENERAL

1.01 SCOPE

A. This section covers general installation requirements of new equipment units that have been purchased by the CONTRACTOR as part of this Work. Equipment-specific installation requirements are covered in the equipment sections.

1.02 GENERAL

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by ENGINEER.

1.03 COORDINATION

A. When the manufacturer's field services are provided by the equipment manufacturer, CONTRACTOR shall coordinate the services with the equipment manufacturer. CONTRACTOR shall give ENGINEER written notice at least 30 days prior to the need for manufacturer's field services furnished by others.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Materials shall be as follows:

1. Grout: As specified in the Grouting section.

2. Anti-Seize thread lubricant for SS bolts: as specified in the Anchorage in the Concrete and Masonry section.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results.

B. Each equipment unit shall be leveled, aligned, and shimmed into position. Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

C. Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless-steel bolts during assembly. For equipment installed in drinking water facilities, the anti-seize lubricant shall meet the requirements of NSF-61.

D. When specified in the equipment sections, the equipment manufacturer will provide installation supervision and installation checks. For installation supervision, the manufacturer's field representative will observe, instruct, guide, and direct the CONTRACTOR's erection or installation procedures as specified in the equipment specifications. For installation checks, the manufacturer's field representative will inspect the equipment installation immediately following installation by CONTRACTOR and observe the tests indicated in the equipment sections. The manufacturer's representatives will revisit the site as often as necessary to ensure installation is satisfactory to OWNER.

E. All equipment shall be protected by the CONTRACTOR after installation, prior to final acceptance by OWNER. Protection provisions shall be as recommended by the manufacturer and shall include provisions to prevent rust, mechanical damage, and foreign objects entering the equipment.

3.02 STARTUP AND TESTING

A. Startup requirements and tests associated with startup shall be as indicated in the equipment sections. Other field tests shall be as indicated in the specific equipment sections. The startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.

B. Preliminary field tests shall be conducted on all equipment by CONTRACTOR on the equipment indicated in the equipment sections, and the tests shall be performed as indicated. When an installation check is specified in the equipment sections, the equipment manufacturer's representative will participate in these tests to the extent described in the equipment sections.

C. These tests shall not be considered an acceptance test but rather a test to determine initial performance curves and efficiency just prior to the equipment entering service.

END OF SECTION

SECTION 01 73 29
CUTTING, CORING, AND PATCHING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section covers the cutting, coring, rough and finished patching of holes and openings. Holes and openings may be in existing construction or in parts of new construction. Procedures for cutting and patching will be the same for either condition.

B. All cutting, coring, and rough patching shall be performed by the CONTRACTOR. Finish patching shall be the responsibility of the CONTRACTOR and shall be performed by the trade associated with the application of the particular finish.

C. Provide all cutting, fitting, and patching, including attendant excavation and backfill, required to complete the work or to:

1. Make its several parts fit together properly.

2. Uncover portions of the work to provide for the installation of ill-timed or improperly scheduled work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of Contract Documents.

5. Remove samples of installed work as specified for testing.

6. Provide penetrations of structural surfaces and materials for installation of piping, ductwork, equipment, and electrical conduit.

7. Provide penetrations of non-structural surfaces and materials for installation of piping, ductwork, equipment, and electrical conduit. The determination of what is a nonstructural surface or material shall be made by the ENGINEER.

8. Remove, install, or relocate materials or equipment.

1.02 RELATED WORK

A. Concrete is included in Division 3.

1.03 SUBMITTALS

A. Submit, in accordance with SECTION 01 33 00 – Submittal Procedures, a written request prior to executing any cutting or alteration which is not shown or detailed on the contract documents which affects or requires:

1. Cutting structural members.

2. Holes drilled in beams or other structural members.

3. Work of the OWNER or any separate CONTRACTOR.

4. Structural value or integrity of any element of the project.

5. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.

6. Efficiency, operational life, maintenance, or safety of operational elements.

7. Visual qualities of sight-exposed elements.

B. Request shall include:

1. Identification of the project.

2. Description of affected work.

3. The reason for cutting, alteration, or excavation.

4. Effect on work of OWNER or any separate CONTRACTOR, or on structural or weatherproof integrity of the project.

5. Description of proposed work:

a. Method and extent of cutting, patching, alteration, or excavation.

b. Trades who will execute the work.

c. Products proposed to be used.

d. Extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. If the work is considered out of scope, provide a cost proposal.

8. Confirmation of coordination with any separate CONTRACTOR whose work will be affected.

9. Related shutdown requests if required to do the work.

10. Request for hot work permit if required to do the work.

C. Submit written notice to the ENGINEER designating the date and the time the work will be uncovered.

D. When a written request is required, do not proceed with the work until a written notice to proceed is received from the ENGINEER.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Comply with specifications and standards for each specific product involved. Where there is no equivalent specification, the CONTRACTOR shall notify the ENGINEER who will provide a specification for the materials to be used.

B. Concrete and grout for rough patching shall be as specified in Divisions 3 and 4.

C. Materials for finish patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the ENGINEER prior to their use.

PART 3 – EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products, or performance of work.

C. Report unsatisfactory or questionable conditions to the ENGINEER in writing; do not proceed with work until the ENGINEER has provided further instructions.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

B. Protect surrounding materials and equipment prior to starting work.

C. Contain and control cooling liquids and slurry produced by the cutting and coring operations.

D. When the cutting or coring will result in the structure or equipment being exposed to provide adequate weather protection.

3.03 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work. When excavating in close proximity to piping, duct banks or other items subject to damage, use hand excavation.

C. All equipment and workplace safety shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.

D. Where possible, employ original installer or fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.

E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

F. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish entire unit.

H. Remove rubble and excess patching materials from the premises.

3.04 CORING

A. All coring shall be performed in such a manner as to limit the extent of patching. Locate the rebar before coring to minimize cut throughs.

B. Coring shall be performed with an approved non-impact rotary tool with diamond core drills.

C. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.

D. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

E. Fit to pipes and other penetrations in tanks to be water tight using seals or other methods defined in the specifications.

F. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. All work shall be performed by mechanics skilled in this type of work.

G. If holes are cored through floor slabs they shall be drilled from below where possible. If holes are drilled from above, provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.05 CUTTING

A. All cutting shall be performed in such a manner as to limit the extent of patching.

B. Fit work to minimize space to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.

D. Provide for control of slurry generated by sawing operation on both sides of the wall and from below if cutting a floor.

E. When cutting a reinforced concrete wall or floor, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in the structure. Cut shall be made so that steel neither protrude nor is recessed from the face of the cut.

F. Adequate bracing of the area to be cut shall be installed prior to the start of cutting. Check the area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of the cut area during sawing operations.

G. Provide equipment of adequate size to remove cut panels.

H. Saw cut concrete and masonry prior to breaking out sections.

I. Install work at such time as to require the minimum amount of cutting and patching.

J. All cutting of structural members shall be done in a manner directed by the ENGINEER.

K. Cut opening only large enough to allow easy installation of the equipment, ducting, piping, or conduit.

L. When existing conduits or pipe sleeves are cut off at the floor line or wall line, they shall be filled with grout or suitable patching material.

3.06 PROTECTION

A. Welded Provide devices and methods to protect other portions of project from damage.

B. Provide protection from elements for that portion of the project which may be exposed

by cutting and patching work.

C. Maintain excavations free from water.

3.07 PATCHING

A. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.

B. Finish patching shall match existing surfaces as approved.

C. Patching shall be of the same kind and quality of material as was removed.

D. The completed patching work shall restore the surface to its original appearance or better.

E. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.

F. Equipment damaged during cutting and patching shall be replaced or repaired by the equipment manufacturer, at the ENGINEER's sole discretion and at the expense of the CONTRACTOR doing the work.

G. Repaint any damage to factory-applied paint finishes using touch-up paint furnished by the equipment manufacturer.

H. Slurry or tailings resulting from coring or cutting operations shall be contained and vacuumed or otherwise removed from the area following drilling or cut.

I. Equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching

J. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCUDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Section covers closeout activities required at the end of the Project.

1.02 PROCEDURES

A. CONTRACTOR, OWNER, and ENGINEER Responsibilities:

1. ENGINEER will inspect the WORK to determine if it is complete and issue a "Punch List" of items to be completed or corrected by the CONTRACTOR.

2. CONTRACTOR shall complete and/or correct all punch list items and notify ENGINEER, in writing, that the WORK is ready for final inspection.

3. ENGINEER will make final inspection.

a. When the WORK is found to be acceptable under the conditions of the CONTRACT DOCUMENTS, and all items required are completed, ENGINEER will recommend to OWNER that the WORK is acceptable.

b. If OWNER agrees with the recommendation, OWNER will issue CONTRACTOR a letter of "Final Acceptance".

4. CONTRACTOR shall submit a final payment request to ENGINEER for review and approval.

B. Final Paperwork:

1. Prior to final payment, CONTRACTOR shall deliver the following items to ENGINEER:

a. CONTRACTOR's written one (1)-year guarantee of materials and workmanship.

b. All guarantees, warranties, and submittals, as specified.

c. Receipts for extra materials delivered to OWNER.

d. Final payment request.

e. CONTRACTOR's Statement Concerning Claims Form.

f. All required indemnifications.

g. Releases from property owners for special easements.

h. Redlined as-constructed drawings.

1.03 GUARANTEE

A. CONTRACTOR shall guarantee all materials and equipment furnished and WORK performed for a period of one (1) year from the date of final acceptance for all WORK performed under the terms of this CONTRACT.

B. CONTRACTOR shall further warrant and guarantee for a period of one (1) year from date of final acceptance that all WORK is free from any and all defects due to faulty materials or workmanship.

C. Corrections of Defects:

1. CONTRACTOR, within the one (1) year performance guarantee period, shall promptly make such corrections as may be necessary by reason of such defects, including the repairs of any damage to other parts of the system resulting from such defects.

2. OWNER will give notice of observed defects with reasonable promptness.

a. OWNER will inform CONTRACTOR of defects and CONTRACTOR shall within ten (10) days begin the work of repair or replacement.

3. Should CONTRACTOR fail to begin such WORK within ten (10) days, or in the event that CONTRACTOR fails to make such repairs, adjustments, or other work that may be made necessary by such defects, OWNER may make the repairs or replacements at the expense of CONTRACTOR and charge CONTRACTOR the cost thereby incurred.

4. If OWNER determines that immediate action to make repairs or replacements is necessary because of emergency conditions or to prevent further loss or damage, OWNER may proceed without notice to CONTRACTOR but at the expense of CONTRACTOR.

D. The PERFORMANCE BOND shall remain in full force and effect through the guarantee period.

E. Should OWNER claim by WRITTEN NOTICE before the guarantee period expires that certain defects exist and require repair or replacement, the guarantee period shall be automatically extended for as long as these defects exist.

F. CONTRACTOR agrees that OWNER will be the final authority on whether or not a defect is one covered by the guarantee.

1.04 FINAL PAYMENT AND ACCEPTANCE

A. General:

1. Upon completion of the WORK, and recommendation by the ENGINEER that the WORK is acceptable, OWNER will issue a letter that the WORK has been accepted under the conditions of the CONTRACT DOCUMENTS.

2. The entire balance found to be due to CONTRACTOR, including the retained percentages, except such sums as may be lawfully retained by OWNER, will be paid to CONTRACTOR within forty-five (45) days of completion and acceptance of the WORK.

B. Claims Against Contractor:

1. CONTRACTOR shall indemnify and save OWNER, ENGINEER, and OWNER's agents harmless from all claims growing out of the lawful demands of SUBCONTRACTOR(s), laborers, workers, mechanics, and SUPPLIER(s) of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the WORK.

2. CONTRACTOR shall, at OWNER's request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived by providing the required Statement Concerning Claims.

3. If CONTRACTOR fails to do so, OWNER may, after having notified CONTRACTOR, either pay unpaid bills or withhold from CONTRACTOR's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon all payment to CONTRACTOR shall be resumed in accordance with the terms of the CONTRACT DOCUMENTS; but in no event shall the provisions of this sentence be construed to impose any obligations upon OWNER to either CONTRACTOR, the Surety, or any third party.

4. In paying any unpaid bills of CONTRACTOR, any payment so made by OWNER will be considered as a payment made under the CONTRACT DOCUMENTS by OWNER to CONTRACTOR and OWNER shall not be liable to CONTRACTOR for any such payments made in good faith.

C. Late Payment to Contractor:

1. If OWNER fails to make payment forty-five (45) days after approval by ENGINEER, in addition to other remedies available to CONTRACTOR, there will be added to each such payment the interest at the maximum legal rate commencing on the first day after said payment is due and continuing until the payment is received by CONTRACTOR.

D. Acceptance of Final Payment as Release:

1. The acceptance by CONTRACTOR of final payment shall be and shall operate as a release to OWNER of all claims and all liability to CONTRACTOR other than claims in stated amounts as may be specifically excepted by CONTRACTOR for all things done or furnished in connection with this WORK and for every act and neglect of OWNER and others relating to or arising out of this WORK.

2. Any payment, however, final or otherwise, will not release CONTRACTOR or the sureties from any obligations under the CONTRACT DOCUMENTS or the PAYMENT AND PERFORMANCE BOND(s).

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 FINAL CLEANING

A. Upon completion of the WORK, CONTRACTOR shall, as soon as practicable, remove all waste materials, excess materials, tools, and equipment such as scaffolding, temporary structures, and facilities such as fencing and sanitary facilities.

B. Upon completion of WORK on structures designed for human occupancy, CONTRACTOR shall clean and replace broken or scratched windows, clean and repair all surfaces, and clean and adjust all units of equipment which are part of the various building systems.

C. The completed WORK shall be ready for full use before it is given a final inspection. Final payment will not be made to CONTRACTOR until all cleanup is done to the satisfaction of ENGINEER and OWNER.

END OF SECTION

SECTION 01 78 36
WARRANTIES AND BONDS

PART 1 – GENERAL

1.01 SUMMARY

A. This section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including the manufacturer's standard warranties on products and special warranties.

B. Related Sections

1. SECTION 01 77 00 – Closeout Procedures

1.02 SUBMITTALS

A. Submit written warranties to the OWNER prior to the date fixed by the ENGINEER for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the OWNER.

B. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the CONTRACTOR or the CONTRACTOR and Subcontractor, supplier, or manufacturer. Submit a draft to the OWNER for approval prior to final execution.

C. Refer to individual Sections for specific content requirements and particular requirements for the submittal of special warranties.

D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8½- inch by 11-inch paper.

E. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the Section in which specified and the name of the product or work item.

F. Provide heavy paper dividers with celluloid-covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of the installer, supplier, and manufacturer.

G. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the project title or name, and the name, address, and telephone number of the CONTRACTOR.

H. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.03 WARRANTY EQUIPMENT

A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure, or that must be removed and replaced to provide access for correction of warranted work.

B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The CONTRACTOR is responsible for the cost of replacing or rebuilding defective work regardless of whether the OWNER has benefited from the use of the work through a portion of its anticipated useful service life.

D. OWNER's Recourse: Written warranties made to the OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the OWNER can enforce such other duties, obligations, rights, or remedies.

E. Rejection of Warranties: The OWNER reserves the right to reject warranties and to limit selections to products with warranties not in conflict with the requirements of the contract Documents.

F. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the CONTRACTOR of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the CONTRACTOR.

1.04 MANUFACTURER'S CERTIFICATIONS

A. Where required, the CONTRACTOR shall supply evidence, satisfactory to the ENGINEER, that the CONTRACTOR can obtain manufacturers' certifications as to the CONTRACTOR's installation of equipment.

1.05 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the OWNER.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the OWNER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02 41 13
BUILDING AND STRUCTURE DEMOLITION

PART 1 – GENERAL

1.01 SUMMARY

A. This section addresses the work related to furnishing all supervision, labor, materials and equipment in the work for demolition of existing buildings and structures.

B. Related sections

1. SECTION 31 23 00 – Earthwork

2. SECTION 32 92 19 – Seeding

1.02 SECTION INCLUDES

A. Demolition of designated structures and appurtenances, backfilling, and removal of materials from site.

B. Demolition and removal of foundations and slabs-on-grade.

C. Disconnecting and abandonment or removal of identified utilities.

D. Filling of underground structures and abandonment of piping.

E. Demolition and removal of fences.

1.03 Record Drawings

A. Submit in accordance with supplemental specification for water and sanitary sewer record drawings.

B. Accurately record actual locations of abandoned utilities or subsurface obstructions remaining on site.

1.04 Regulatory Requirements

A. Comply with Laws and Regulations for demolition of structures, protection of adjacent structures, dust control, runoff control, and disposal.

B. Obtain required permits from authorities.

C. Notify affected utility companies and ENGINEER before starting work and comply with their requirements.

D. Do not close or obstruct roadways or sidewalks without permits.

E. Conform to procedures applicable when hazardous or contaminated materials are encountered.

PART 2 – PRODUCTS

2.01 ALLOWABLE PRODUCTS

A. Stone shall be in accordance with Section 801 of the effective edition of the ALDOT Standard Specifications for Highway Construction.

B. Topsoil shall be in accordance with Section 650 of the effective edition of the ALDOT Standard Specifications for Highway Construction.

PART 3 – EXCECUTION

3.01 PREPARATION

A. Provide, erect, and maintain temporary barriers and security devices.

B. Protect existing landscaping materials, appurtenances, and structures, which are not to be demolished.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

D. Mark location of existing utilities.

E. Dewater all tanks and structures designated to be demolished; remove and legally dispose of all liquid, sludge, and scum.

F. Remove all designated equipment, piping, electrical components, and appurtenances.

3.02 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify ENGINEER. Do not resume operations until so directed by ENGINEER.

C. Conduct operations with minimum interference to public or private accesses. Maintain and protect egress and access at all times.

D. Obtain written permission from adjacent property owners when demolition equipment or activity will affect their property.

E. Sprinkle Work with water to minimize dust. Provide hoses, water connections, and water for this purpose.

F. Repair or replace structures, equipment, piping, etc. that is to remain in service if they are damaged by demolition operations. ENGINEER shall have sole authority to determine whether repair or replacement is appropriate.

3.03 Demolition

A. Disconnect and cap all utilities designated for removal within demolition areas, as required. Provide appropriate blind flanges, plugs, and caps for remaining piping. When piping is removed in an area to be abandoned by filling, remaining wall castings and pipes shall be plugged by filling with flowable fill.

B. Remove existing pump station completely.

C. Remove concrete slabs on grade.

D. Backfill with #610 crushed limestone

E. Remove demolished materials from site.

F. Do not burn materials on site. Leave site in clean condition.

G. Remove temporary work.

H. Fill and grade site; follow SECTION 31 23 00 – Earthwork.

I. Seed all areas of fill and other earth areas disturbed by operations; follow Section 32 92 19, Seeding.

3.04 SCHEDULES

A. Items to be removed by the CONTRACTOR and to be retained by OWNER; deliver to and place in storage at the OWNER'S Maintenance Yard. All equipment is reserved for the OWNER. OWNER will tag all items to be salvaged prior to demolition work. The CONTRACTOR shall coordinate delivery of any items removed with the OWNER.

END OF SECTION

SECTION 03 15 00
CONCRETE PROTECTIVE COATINGS

PART 1 – GENERAL

1.01 SUMMARY

A. This section addresses the work related to furnishing and installing all supervision, labor, materials and equipment in the work for concrete protective coatings, surface preparation, mix design, placement procedures, and finishes.

1.02 RELATED SECTIONS

A. SECTION 01 60 00 – Product Requirements

B. SECTION 03 30 00 – Cast-in-Place Concrete

C. SECTION 03 40 00 – Precast Concrete Wet Wells and Valve vaults

D. SECTION 09 97 23 – Protective Coating for Sewer Structures

1.03 SUBMITTALS

A. Design Data

1. Technical data sheet on each product used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

B. Instructions

1. Epoxy Primer, Epoxy Resin Binder, and Coating System: Surface preparation; mixing; curing; application methods, rates and thickness; and holiday detection and repairing.

C. Reports

1. Epoxy Resin Binder and Epoxy Primer – include the following:

a. Viscosity

b. Consistency

c. Gel time

d. Absorption

e. Shrinkage

f. Thermal compatibility

2. Coating-Include the following:

    a. Viscosity

    b. Number of Coats

    c. Tensile strength

    d. Abrasion resistance

    e. Hardness

    f. Adhesive strength

D. Product Experience and Test Data-Coating

1. Provide documentation including project information, reference, and contact information regarding at least ten similar coating applications that have been in service for five years.

2. The applicator firm shall be certified in writing by the manufacturer of the protective coating system.

3. Proof of a minimum of 2,000 manhole/wet well structures having been rehabilitated by the CONTRACTOR shall be submitted with the bid.

4. Provide certified test data documenting compliance with Section 2.02C and applicable standards for epoxy coatings used in acid environments.

E. Certificates - Training and Qualifications

1. All personnel associated with the mixing, handling, and placing of epoxy products shall be certified for a minimum of three years by the manufacturer as trained and qualified to perform all operations in accordance with the requirements of the manufacturer and these contract documents. Submit training and qualification certificates for the following products:

    a. Epoxy Resin Binder

    b. Epoxy Primer

    c. Epoxy Primer

2. Applicator shall establish quality control procedures and practices to monitor phases of surface preparation, storage, mixing, application, and inspection throughout the duration of the project. CONTRACTOR to provide a fulltime, on-site person whose dedicated responsibilities will include quality control of the Structural Epoxy linings and completed manufacturing certification training.

F. Pre-Installation Meeting:

1. CONTRACTOR, installer and technical representative of the corrosion protection lining manufacturer shall meet on-site with ENGINEER to discuss approved products and workmanship to ensure proper application of the corrosion protection lining components and substrate preparation requirements.

G. Warranty:

1. Applicator shall warrant all work against defects in materials and workmanship for a period of two (2) years, unless otherwise noted, from the date of final acceptance of the project. Applicator shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said two (2) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the OWNER.

1.04 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The referenced publications shall be the current effective edition.

B. American Concrete Institute (ACI)

1. ACI 224.1R – Causes, Evaluation and Repair of Cracks in Concrete Structures

2. ACI 301 – Specifications for Structural Concrete

3. ACI 308R – Guide to Curing Concrete

4. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary

5. ACI 546.R – Concrete Repair Guide

6. ACI 546.3R – Guide for the Selection of Materials for the Repair of Concrete

C. American Society for Testing and Materials (ASTM)

1. ASTM C 868 – Standard Test Method for Chemical Resistance of Protective Linings

2. ASTM C 1583/1583M – Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)

3. ASTM D 4060 – Standard Test Method for Abrasion Resistance of Organic Linings by the Taber Abrader

4. ASTM D 4285 – Standard Test Method for Indicating Water or Oil in Compressed Air

5. ASTM D 4414 – Standard Practice for Measurement of Wet Film Thickness by Notch Gages

6. ASTM D 7682 – Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty

7. ASTM F 2414 – Standard Practice for Sealing Sewer Manholes Using Chemical Grouting

8. ASTM G 210 – Standard Practice for Operating the Severe Wastewater Analysis Testing Apparatus

D. National Association of Corrosion Engineers (NACE)

1. NACE Publication 6D-173 – A Manual for Painter Safety

2. NACE SPO188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

3. NACE No. 6/ SSPC-SP13 - Surface Preparation for Concrete

E. Society of Protective Coating (SSPC)

1. SSPC SP 13 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

F. International Concrete Repair Institute (ICRI)

1. Guideline No. 310.1R – Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion

2. Guideline No. 310.2 – Selecting and Specifying Concrete Surface Preparation for Sealer, Linings, and Polymer Overlays

1.05 DEFINITIONS

A. Epoxy Resin Binder

1. A two-component epoxy bonding system, in low and medium viscosities, that is used by itself as a primer or for producing epoxy concrete or mortars when mixed with aggregate.

B. Epoxy Primer

1. A two-component Polyamide based epoxy primer that adheres to masonry, metal, dry and damp concrete surfaces.

C. Coating System

1. Epoxy Coating System: A 100% solids epoxy lining system suitable for application on concrete surfaces and having resistance to deterioration by gases and liquids typical of a municipal sewer system. The system shall be suitable for application on horizontal, vertical, and overhead surfaces.

1.06 MEASUREMENT AND PAYMENT

A. Concrete coating will be paid for as part of the Lump Sum Payment for the Contract and will not be measured for separate payment.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver material in manufacturer's original, unopened and undamaged packages.

2. Clearly identify manufacturer's, brand name, contents, color, batch number, and any personal safety hazards associated with the use of or exposure to the materials on each package.

3. Packages showing indications of damage that may affect the condition of contents are not acceptable.

B. Storage of Materials:

1. Materials shall be stored in accordance with the manufacturer's recommendations in enclosed structures and shall be protected from weather and adverse temperature conditions. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life as defined by the manufacturer shall be removed promptly from the site. Store all materials only in area or areas designated by the ENGINEER solely for this purpose.

2. Store in original packaging under protective cover and protect from damage.

3. Stack containers in accordance with manufacturer's recommendations.

C. Handling of Materials:

1. Handle materials in such a manner as to prevent damage to products or finishes.

1.08 ENVIRONMENTAL LIMITATIONS

A. Proceed with Work only when temperature and moisture conditions of substrates, air temperature, relative humidity, dew point and other conditions comply with the Structural Epoxy lining manufacturer's written recommendations and when no damaging environmental conditions are forecasted for the time when the material will be vulnerable to such environmental damage. Record all such conditions and include in the final Site Quality Control Report.

B. Maintain substrate temperature and ambient temperature before, during and after installation above 45°F (8°C) and rising in accordance with Structural Epoxy lining material manufacturer's instructions.

C. Provide adequate ventilation during instillation and full curing periods of the Structural Epoxy lining.

D. Structural Epoxy lining shall not be applied when ambient air temperature is within 5°F (3°C) of the dew point.

E. Structural Epoxy lining shall not be applied when relative humidity is outside of material manufacturer's recommendations. Do not prepare surfaces or apply materials in rain, snow, fog, mist, or otherwise inclement weather as per material manufacturer's instructions.

F. Dust and Contaminants:

1. Protect work and adjacent areas from excessive dust and airborne contaminants during Structural Epoxy lining application and curing. Schedule Work to avoid excessive dust and airborne contaminants.

PART 2- PRODUCTS

2.01 MATERIALS

A. Cementitious Repair Mortar

1. Rapid-setting, cementitious repair mortar when concrete is deteriorated greater than a depth of 1/4-inch (6.35 mm) and when recommended by the Manufacturer to rehabilitate and restore concrete and provide level substrate for application of the protective lining. Cementitious repair mortar shall be a rapid-setting, non-shrinking resurfacing material capable of spray-transfer. Material shall have similar CLTE properties as concrete.

B. Cementitious Repair Resurfacer

1. Epoxy cementitious resurfacer shall be an epoxy-modified, aggregate reinforced material for surfacing, patching and filling voids and bugholes in concrete. The material shall be suitable for the application down to 1/16 inch (1.6 mm) thickness and be capable of spray-transfer.

C. Hydraulic Water Plug

1. Active leak control materials are to be utilized for I&I abatement, to stop leaks, running water, infiltration, and other water stop needs. Material must be a quick setting, hydraulic cement compound designed for minor patching, and as a leak stopper and water plug which stops running water and/or seepage through concrete. Materials must be designed to set rapidly, in dry powder form, with no prior mixing of water needed, directly to active leaks under hydrostatic pressure in manholes or related structures, in accordance with the manufacturer's recommendations.

D. Epoxy Primer

1. When required or recommended by the coating manufacturer, or these documents, apply an epoxy primer to the concrete surfaces receiving the coating. The primer type and application shall be in strict conformance with the coating manufacturer's instructions.

E. Coating

1. General

a. Coating shall be 100% solids epoxy system specifically resistant to corrosive wastewater environments. The coating shall be capable of withstanding, without detrimental effect, continuous contact with or immersion in 10% sulfuric acid solution, moisture, turbulent sewage flow, and temperatures ranging from 20 degrees F. to 120 degrees F.

F. Acceptable Manufacturers

1. Tnemec Company, Inc. / Epoxytec

2. Induron Company / Induron Protective Coatings

3. Approved Equal

PART 3- EXECUTION

3.01 EXAMINATION

A. CONTRACTOR shall examine the areas and conditions under which the Structural Epoxy coating Work is to be performed in accordance with SSPC-SP13/NACE No. 6, and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work.

B. Commencement of the Work of this Section shall indicate that the substrate and other conditions of installation are acceptable to the CONTRACTOR and his Applicator and will produce a finished product meeting the requirements of the Specifications. All defects resulting from accepted conditions shall be corrected by the CONTRACTOR at his own expense.

C. Stopping Active Leaks: After surface cleaning, any visible leaks or other water ingress shall be reported to the ENGINEER. Any water infiltration through minor leaks must be stopped using coating manufacturer approved hydraulic water stop. Surface and grouting material may require additional surface preparation prior to application of Structural Epoxy coating.

D. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, coating installation should be scheduled when the temperatures are falling versus rising.

3.02 PREPARATION

A. Clean and prepare all interior horizontal, vertical and overhead concrete surfaces of wet well portion of pump station in accordance with SSPC SP13. Sand blast and/or water blast with high-pressure water cleaning equipment at 5000 to 10,000 psi at a flow of at least 4 gallons per minute. Cleaned surface must be free of all dirt, debris, oil, grease, fats, chemical contamination, salts, solvents, surface hardeners, incompatible curing compounds and form release agents, laitance, and efflorescence. A 28-day minimum cure time is required for all new concrete surfaces before any coating components may be applied.

B. The CONTRACTOR shall conduct a visual inspection of wetwell after it is cleaned. All active, hydrostatic infiltration leaks shall be plugged or sealed with an appropriate hydraulic cement compatible with the cementitious lining. Injection grouting may be required to seal active leaks including leaks in existing invert channels and benches. All loose mortar and rubble of existing walls, benches and inverts shall be removed. The CONTRACTOR shall prepare the wetwell to receive cementitious lining as necessary by reshaping and repairing benches, inverts, and walls where required. All interior surfaces shall be prepared as recommended by the manufacturer. Minimum requirements are as listed below.

   1. All cracks and other voids must be repaired and filled with suitable non-shrinking cements, sealants or grouts, including all voids between the existing sewer pipes and wetwell walls. All patches shall be smooth and even with the wetwell wall.

   2. All voids around existing wetwell rungs/steps shall be filled.

   3. All surfaces shall be suitably prepared for the required bonding of the cementitious lining as recommended by the manufacturer.

C. Obtain written approval of the ENGINEER prior to applying any new material on existing surfaces.

D. Structures to receive Structural Epoxy coating system must be capable of withstanding imposed loads. All oil, grease, waste and chemical contaminants must be removed from the surface of the concrete prior to preparation in accordance with NACE No. 6/SSPC-SP13. Concrete surfaces must be sound and capable of supporting the Structural Epoxy Lining system as determined by the ENGINEER. Surface preparation requirement is to expose a sound, uniform surface texture confirming to the minimum recommended ICRI-CSP amplitude. The appropriate cementitious repair mortar or epoxy cementitious resurfacer material shall be applied to the entire, prepared surface to level surface suitable for coating.

E. The objective of surface preparation is to produce a surface that is suitable for application and adhesion of the specified repair materials and coating/lining material. Surfaces therefore are to be free of contaminants and loosely adhering or unsound concrete, and should provide a dry, sound, uniform substrate suitable for the application of repair and coating/lining material.

3.03 PLACEMENT

A. Application of Coating

1. Application procedures shall conform to the recommendations of the coatings manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

2. The CONTRACTOR shall use equipment as recommended by the manufacturer for the application of the coating. The coating system shall be applied to a thickness required by the manufacturer and as specified by the contract documents and measured with a wet film thickness gauge.

3. Test for pinholes in coating using high voltage holiday detection equipment to ensure a pin-hole free lining. Repair pin-holes in accordance with manufacturer's recommendations and retest to ensure the finish coat is free of pin-holes.

4. The coating material must be applied by a certified applicator of the coating manufacturer.

5. The minimum thickness of the coating system (prime and finish coat) shall be 125 mils.

6. All exposed new, rehabilitated, and existing concrete surfaces within the wet well shall be coated.

7. Structural Epoxy is to provide protection from H2S and seal from I&I with applied and bonded high build Structural Epoxy; Structural Epoxy film thickness specified herein is designed and intended for applied and bonded coating, delivering barrier protection lining with high mechanical strength and a reinforced film to bridge and seal against moisture vapor transmission (MVT), hydrostatic head pressure, fine root intrusion, and seal against inflow and infiltration (I&I); while protecting from effluent and H2S.

3.04 FIELD QUALITY CONTROL, INSPECTION, AND TESTING

A. Testing

1. CONTRACTOR to perform the quality control procedures listed below in conjunction with the requirements of this Section.

2. Inspect all materials upon receipt to ensure that all are supplied by the approved Manufacturer.

3. Provide verification of correct mixing of coating materials in accordance with the Manufacturer's instructions.

4. Verify curing of the coating materials in accordance with the Manufacturer's instructions.

5. Dry-Film Thickness:

   a. Wet-Film Thickness shall be taken every 100 square feet (9 square meters) in accordance with ASTM D 4414 and recorded.

b. The Dry-Film Thickness can be determined using a surface area calculation for material consumption.

6. High-Voltage Holiday (Spark) Testing: Upon full cure, the installed lining system shall be checked by high voltage spark detection in accordance with NACE SP0188 and the Manufacturer's printed application guide to verify a pinhole-free surface. Areas which do not pass the spark detection test shall be corrected at no cost to the OWNER.

   a. Holiday detection results shall only be valid if the ENGINEER's Inspector witnesses all testing and co-signs the inspection report to indicate concurrence with the report's contents.

7. CONTRACTOR is responsible for keeping the ENGINEER informed of all progress so that the ENGINEER may provide additional quality control at his discretion.

8. Inspection by the ENGINEER or others does not absolve the CONTRACTOR from his responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.

9. Visual Inspection - A final visual inspection shall be made by the ENGINEER and the manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the manufacturer's recommendations.

B. Manufacturer's Representative

1. Manufacturer's representative shall be on-site to inspect the completed surface preparation and for final inspection. Holiday detection results shall only be valid if the Manufacturer's Representative witnesses all testing and co-signs the inspection report to indicate concurrence with the report's contents.

3.05 ACCEPTANCE CRITERIA

A. All surfaces shall be prepared, applied, and tested in accordance with the specification and referenced standards herein.

3.06 ADJUSTMENTS AND CLEANING

A. At the completion of the Work, CONTRACTOR shall remove all materials and debris associated with the Work of this Section.

B. Clean all surfaces not designated to receive Structural Epoxy coating. Restore all other work in a manner acceptable to ENGINEER.

C. All finished Structural Epoxy coating shall be protected from damage until Final Acceptance of the Work. Structural Epoxy coating damaged in any manner shall be repaired or replaced at the discretion of ENGINEER, at no additional cost to OWNER.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Preparation

B. Joints

C. Installation of Embedded Items

D. Concrete Placement

E. Patching

F. Defective Concrete

G. Field Testing Concrete

1.02 RELATED SECTIONS

A. SECTION 33 30 00 – Sanitary Sewerage

1.03 REFERENCE STANDARDS

A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

B. ACI 305 - Hot Weather Concreting

C. ACI 306 - Cold Weather Concreting

D. ACI 308 - Standard Practice for Curing Concrete

E. ACI 318 - Building Code Requirements for Reinforced Concrete

F. ACI 211.1 - Recommended Practice for Selecting Proportions for Normal Weight Concrete

G. ACI 347 - Recommended Practice for Concrete Form Work

H. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures

I. ACI 503.1 - Standard Specifications for Bonding Plastic Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive

J. ASTM B-221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

K. ASTM C-33 - Concrete Aggregates

L. ASTM C-94 - Ready-Mixed Concrete

M. ASTM C-150 - Portland Cement

N. ASTM C-260 - Air Entraining Admixtures for Concrete

O. ASTM C-330 - Light Weight Aggregates for Structural Concrete

P. ASTM C-494 - Chemical Admixtures for Concrete

Q. ASTM C-618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

R. ASTM C-948 - Test Method for Dry and Wet Bulk Density, Water Absorption and Apparent Porosity of Thin Sections of Glass-Fiber-Reinforced Concrete

S. ASTM D-994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type)

T. ASTM D-1190 - Concrete Joint Sealer, Hot-Poured Elastic Type

U. ASTM D-1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

V. ASTM D-1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 QUALITY ASSURANCE

A. The CONTRACTOR shall perform Work in accordance with ACI 301 and ACI 318.

B. The CONTRACTOR shall maintain one copy of documents on-site.

C. The CONTRACTOR shall acquire cement and aggregates from the same source for all work.

D. The CONTRACTOR shall conform to ACI 305 when concreting during hot weather.

E. The CONTRACTOR shall conform to ACI 306 when concreting during cold weather.

F. Testing Laboratory Services:

1. The OWNER will employ and pay for the services of an independent geotechnical testing laboratory to perform specific services and necessary tests as outlined below:

a. All mix designs shall be proportioned in accordance with the current edition of ACI 318. Mix designs must be approved prior to placing the initial concrete at the job site. Test cylinder frequency and break schedule shall be as specified in Part 3, Article 3.07 – Field Testing Concrete.

b. CONTRACTOR to provide a minimum of 24 hours' notice to ENGINEER prior to pouring concrete.

c. Responsibility for making concrete cylinders and slump tests at the point of placement into the forms shall be as specified in Part 3, Article 3.07 – Field Testing Concrete.

G. Tolerances:

1. The CONTRACTOR shall ensure that cured concrete meets the following tolerances:

a. Variations from plumb = ±3/8-in. per 10 ft. but not more than 1 inch total

b. Variations from level = ±3/8-in. per 10 ft. but not more than ½ inch total

c. Variations from horizontal = ±3/8-in. per 10 ft. but not more than ½ inch total

d. Variations in size and locations = ±1/4 inch openings or sleeves

e. Reinforcing steel placement = ±3/8 inch

1.05 SUBMITTALS

A. The CONTRACTOR shall submit product data.

1. Submit concrete mix design including the following:

a. Breakdown of material content per cubic yard of concrete.

b. Show the dry weight of cement.

c. Show saturated surface-dried weights of fine and coarse aggregate.

d. Show the weight of water.

e. List quantities, types, and names of admixtures.

2. Submit trial mix laboratory reports.

3. Submit product data on each admixture proposed.

4. Submit the certification of aggregate quality. Include a statement for an independent lab that the aggregates used are not reactive.

1.06 STORAGE

A. The CONTRACTOR shall store cement at the site in an approved manner to prevent the absorption of moisture or contamination.

B. The CONTRACTOR shall store aggregates at the site in an approved manner to prevent the inclusion of foreign materials in the concrete.

C. The CONTRACTOR shall store admixtures in an approved manner to prevent contamination, evaporation, or damage. The CONTRACTOR shall protect liquid admixtures from freezing and from harmful temperature ranges.

1.07 QUALIFICATION FOR READY-MIX CONCRETE MANUFACTURER

A. Concrete shall be manufactured and delivered to the project site by a ready-mix manufacturer experienced in ready-mix concrete.

1.08 JOB CONDITIONS

A. The CONTRACTOR shall follow methods outlined in ACI 306 if the concrete is to be placed when the atmospheric temperature is expected to be less than 40° F.

B. Calcium chloride will not be considered for approval as an accelerating admixture during cold weather construction.

C. The CONTRACTOR shall follow methods outlined in ACI 305 if the concrete is to be placed when the atmospheric temperature is expected to exceed 90° F.

D. Manufacturer's recommendations shall be strictly followed in regard to atmospheric temperature limitations during the application of epoxy or acrylic polymer-modified concrete materials.

PART 2 – PRODUCTS

2.01 GENERAL

A. Class A concrete shall be formed reinforced concrete having a 28-day minimum compressive strength of 4000 pounds per square inch. Class A concrete shall be cast-in-place in forms for foundations, pipe collars, footings, piers, sidewalks, curbs and gutters, headwalls, manholes, monolithic sewers, and similar structures.

B. Class B concrete shall be non-formed, non-reinforced concrete having a 28-day minimum compressive strength of 3000 pounds per square inch. Class B concrete shall be used for bottom trench stabilization, pipe protection encasement, pipe collars, anchors, massive sections, and similar work.

C. Other classes, types, or designs for cast-in-place concrete may be specified in the Plans or Special Conditions or approved by the ENGINEER as circumstances require.

D. Concrete ingredients shall be selected, proportioned, and mixed to produce a workable, homogeneous concrete.

E. Concrete components shall conform to the minimum requirements of this section.

2.02 CONCRETE MATERIALS

A. Portland Cement shall conform to the following:

1. All water-bearing structures shall conform to Type V ASTM C-150, including optional tables. Tri-calcium Aluminate shall not exceed 5%.

2. Non-water bearing structures shall conform to the requirements of ASTM C-150, Type 1.

3. The CONTRACTOR shall use one brand of cement throughout the project unless otherwise acceptable to the ENGINEER.

B. Fly Ash, if permitted, shall conform to the requirements of ASTM C-618, Type F.

C. Normal weight aggregates shall conform to the requirements of ASTM C-33 and as specified in this section. The CONTRACTOR shall provide aggregates from a single source for exposed concrete.

1. For exterior exposed surfaces, the CONTRACTOR shall not use fine or coarse aggregates containing spall-causing deleterious substances.

2. Local aggregates not in compliance with the soundness and durability requirements of ASTM C-33 shall not be used except with prior written approval of the ENGINEER and provided it can be shown by special testing or a record of past performance that these aggregates produce concrete of adequate strength and durability. Aggregate soundness testing for fine and coarse aggregates shall be in accordance with ASTM C-88 using a sodium sulfate solution.

D. Fine aggregates shall conform to the requirements of ASTM C-330. The content of material passing a number 200 sieve shall not exceed 4 percent. The CONTRACTOR shall use only clean, sharp, natural sand.

E. Coarse aggregates shall be crushed limestone conforming to the requirements of ASTM C- 33. Crushed limestone for coarse aggregate shall consist of uncoated particles of sound, the durable rock of uniform quality containing no more than 15 percent flat or elongated particles (long dimension more than five times the short dimension). Content of material passing a number 200 sieve shall not exceed 0.5 percent. No surface, yellow or soft stone shall be permitted. The specific gravity of the stone shall not be less than 2.56.

F. Water shall be clean and potable.

G. The CONTRACTOR shall provide concrete admixtures which contain not more than 0.1 percent chloride ions.

1. Water-reducing admixture shall conform to requirements of ASTM C-494, Type A.

2. Air-entraining admixture shall conform to requirements of ASTM C-260, certified by the manufacturer to be compatible with other required admixtures.

3. High-range water-reducing admixture (Super Plasticizer) shall conform to requirements of ASTM C-494, Type F or Type G.

4. Water-reducing, accelerating admixture shall conform to requirements of ASTM C-494, Type E.

5. Water-reducing, retarding admixture shall conform to requirements of ASTM C-494, Type D.

2.03 RELATED MATERIALS

A. Granular Base and/ or Sand Cushion: As shown and specified on the Construction Drawings.

B. Vapor Retarder: The CONTRACTOR shall provide vapor retarder cover over prepared base material where indicated below slabs on grade. The CONTRACTOR shall use only materials that are resistant to deterioration when tested in accordance with ASTM E-154. Vapor retarder shall consist of a Polyethylene sheet not less than 6 mils thick.

C. Absorptive Cover: The CONTRACTOR shall provide burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M-182, Class 2, where required.

D. Moisture-Retaining Cover: During curing, the CONTRACTOR shall provide a moisture-retaining cover complying with ASTM C-171, where required.

E. Liquid Membrane-Forming Curing Compound: The CONTRACTOR shall provide a liquid-type membrane-forming curing compound complying with ASTM C-309, Type I, Class A where required. Apply at 200 sq. ft./gal.

F. Water-Based Acrylic Membrane Curing Compound: The CONTRACTOR shall provide a water-based acrylic membrane curing compound conforming to ASTM C-309, Type I, Class B.

G. Bonding Compound: The bonding compound shall be polyvinyl acetate or acrylic base.

H. Epoxy Adhesive: The CONTRACTOR shall provide epoxy adhesive conforming to ASTM C-881 two-component material suitable for use on dry or damp surfaces. The CONTRACTOR shall provide material Type, Grade, and Class to suit project requirements.

I. Sealer: The CONTRACTOR shall provide a sealer conforming to the ALDOT Standard Specifications.

J. Forms shall be new material at the project start. Undamaged forms meeting the requirements of allowable tolerances may be reused with approval from the ENGINEER. Forms shall be constructed of steel or finished lumber true to line and grade, mortar tight, and free from irregularities and holes. They shall be of sufficient strength to avoid displacement and held together with approved form clamps. Forms shall be coated with non-staining mineral oil or other ENGINEER-approved release agents. Forms shall be removed within 24 to 72 hours after placing concrete but shall not be removed until inspected and approved by the ENGINEER or his agent.

2.04 PROPORTIONING AND DESIGN OF MIXES

A. Concrete mix design for particular applications shall be submitted to the ENGINEER for approval.

B. An independent testing laboratory acceptable to the ENGINEER for preparing and reporting proposed mix designs shall prepare design mixes for each type and strength of concrete by laboratory trial batch methods as specified in ACI 301.

C. Design mixes shall provide normal weight, air-entrained concrete with the following properties, as indicated on the Plans, per ASTM C-94.

1. Cement: Type V ASTM C-150 including optional tables. Tri-calcium Aluminate for all water-bearing structures and surfaces shall not exceed 5%. Type I may be used for non-water-bearing structures.

2. Admixtures:

   a. Air entraining shall conform to ASTM C-260.

   b. Pozzolans shall conform to ASTM C-618.

   c. Admixtures other than air-entraining agents and pozzolans shall be used only when authorized in writing by the ENGINEER.

3. Coarse Aggregate shall be Number 57, conforming to ASTM C-33.

4. Fine Aggregate shall conform to ASTM C-33.

5. Slump shall be between 3 and 5 inches.

6. Air content shall be 6% ± 1%, conforming to ASTM C-94.

7. Mix Proportioning: One Cubic Yard	Class A	Class B
a. Minimum 28 day compressive strength (psi)	4000	3000
b. Cement per cubic yard Concrete (lbs.).		
1. Minimum	517	423
2. Maximum	N/A	517
c. Pozzolan (fly ash) (lbs./cubic yard)	100	N/A
d. Volume of water per cu. ft. of cement – Maximum (Gal) *Water to cement ratio for all water bearing structures and surfaces shall be in the range of 0.45 to 0.48.	*	7.5
e. Amount of air entrained in fresh mix	ASTM C-0 94 (LR)	

2.05 CONCRETE MIXING

A. Ready-mix concrete shall comply with the requirements of ASTM C-94, and as specified.

B. Mix concrete only in quantities for immediate use.

C. Do not retemper or use set concrete.

D. Type V cement shall be used for all sewage-containing structures.

2.06 REINFORCING MATERIAL FOR CAST IN PLACE CONCRETE

A. Reinforcing bars shall conform to the requirements of ASTM A-615, A-616, or A- 617. Reinforcing bars shall be grade 60 deformed bars.

B. Welded wire fabric or cold-drawn wire for concrete reinforcement shall conform to the requirements of ASTM A-185 or ASTM A-82, respectively.

2.07 GROUT FOR FILLING OF VOIDS

A. Grout shall be flowable fill material with a 1000 psi compressive strength at 28 days when using a 4" x 8" cylinder mold. The CONTRACTOR shall submit the design mix to the ENGINEER for approval prior to beginning work.

PART 3 – EXECUTION

3.01 PREPARATION

A. The CONTRACTOR shall prepare previously placed concrete by cleaning it with a steel brush and applying a bonding agent in accordance with the manufacturer's instructions.

B. In locations where new concrete is dowelled to existing work, the CONTRACTOR shall drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.

C. The CONTRACTOR shall coordinate the placement of joint devices with the erection of concrete form work and placement of form accessories.

D. The CONTRACTOR shall coat contact surfaces of forms with an approved, nonresidual, low-VOC form-coating compound before reinforcement is placed.

E. The CONTRACTOR shall not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. The CONTRACTOR shall apply form-coating material in compliance with the manufacturer's instructions.

F. The CONTRACTOR shall coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.02 JOINTS

A. The CONTRACTOR shall locate and install construction joints as indicated or, if not indicated, so as not to impair the strength and appearance of the structure, as acceptable to the ENGINEER.

B. The CONTRACTOR shall provide keyways shown in the Plans, in construction joints for walls, slabs, and between walls and footings as shown on the Plans.

C. The CONTRACTOR shall place construction joints perpendicular to main reinforcement. The CONTRACTOR shall continue reinforcement across construction joints except as otherwise indicated. The CONTRACTOR shall not continue reinforcement through the sides of strip placements.

D. The CONTRACTOR shall use a bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. The CONTRACTOR shall provide water stops in construction joints as indicated. The CONTRACTOR shall install water stops to form a continuous diaphragm in each joint. The CONTRACTOR shall make provisions to support and protect exposed water stops during the progress of Work. The CONTRACTOR shall field-fabricate joints in water stops in accordance with manufacturer's printed instructions.

F. The CONTRACTOR shall construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as equipment bases and elsewhere as indicated.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. The CONTRACTOR shall set and build into Work anchorage devices and other embedded items required for other Work that is attached to or supported by cast-in-place concrete. The CONTRACTOR shall use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. The CONTRACTOR shall set edge forms, bulkheads, and intermediate screed strips for slabs to obtain the required elevations and contours in finished surfaces. The CONTRACTOR shall provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

C. All exposed formed concrete edges shall have a 3/4" chamfer unless otherwise noted.

3.04 CONCRETE PLACEMENT

A. Prior to placing an order for concrete, the CONTRACTOR shall inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. The CONTRACTOR shall notify other crafts to permit the installation of their work and cooperate with other trades in setting such work. In addition to other equipment required for placement, the CONTRACTOR shall provide standby vibrators (minimum of two (2) units) during all concrete placement.

B. The CONTRACTOR shall comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

C. The CONTRACTOR shall deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, the CONTRACTOR shall provide construction joints as herein specified. The CONTRACTOR shall deposit concrete to avoid segregation at its final location.

D. The concrete shall be placed in such a manner to produce solid concrete free of honeycomb, and sand streaks. Concrete shall not be allowed to drop freely a distance greater than 5 feet. Concrete shall be compacted with mechanical vibrating equipment supplemented by hand spading and tamping. It shall be placed upon clean, damp surfaces, free from water. Concrete that has contained its water content for more than 45 minutes shall not be placed unless a variance is approved by the ENGINEER. Freshly placed concrete shall be protected from washy rain, flowing water, or other injurious conditions and shall not be allowed to become dry from the time it is placed until the expiration of the 7-day curing period.

E. The CONTRACTOR shall be required to have all necessary equipment and supplies on-site before starting a pour, including two vibrators, concrete buckets, pumps, cranes, and curing compounds as applicable.

F. The CONTRACTOR shall deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of

several layers, the CONTRACTOR shall place each layer while the preceding layer is still plastic to avoid cold joints. When placing concrete, the use of aluminum pipe or other aluminum conveying devices will not be permitted. Maximum height of concrete free fall shall not exceed 5 feet. The CONTRACTOR shall use placement devices such as chutes, pouring spouts, and pumps as required. Concrete that has contained its water content for more than 60 minutes shall not be placed unless a variance is approved by the ENGINEER.

1. The CONTRACTOR shall consolidate placed concrete with hand-held mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. The CONTRACTOR shall use equipment and procedures for the consolidation of concrete in accordance with ACI 309. Form vibrators are prohibited.

2. The CONTRACTOR shall not use vibrators to transport concrete inside forms. The CONTRACTOR shall insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effects of the machine. The CONTRACTOR shall place vibrators to rapidly penetrate the placed layer and at least 6" into the preceding layer. The CONTRACTOR shall not insert vibrators into lower layers of concrete that have begun to set. At each insertion, the CONTRACTOR shall limit the duration of vibration to the time necessary to consolidate concrete and complete the embedment of reinforcement and other embedded items without causing segregation of mix.

G. The CONTRACTOR shall deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.

1. The CONTRACTOR shall consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. The CONTRACTOR shall bring slab surfaces to the correct level with straightedge and strike-off. The CONTRACTOR shall use bull floats prior to beginning finishing operations.

3. The CONTRACTOR shall maintain reinforcing in the proper position during concrete placement.

H. The CONTRACTOR shall protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures in accordance with provisions of ACI 306.

I. When air temperatures have fallen to or are expected to fall below 40°F (4°C), the CONTRACTOR shall uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C) and not more than 80°F (27°C) at point of placement.

1. The CONTRACTOR shall not use frozen materials or materials containing ice or snow or place concrete on a frozen subgrade or on a subgrade containing frozen materials.
2. The CONTRACTOR shall not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

3. The CONTRACTOR shall maintain the concrete at a temperature of not less than 50°F and not more than 90°F for a period not less than 72 hours.

J. When hot weather conditions exist that would seriously impair the quality and strength of concrete, the CONTRACTOR shall place concrete in compliance with ACI 305 and as herein specified.

1. The CONTRACTOR shall cool ingredients before mixing to maintain the concrete temperature at time of placement below 90°F (32°C).

K. All permanently exposed concrete work inside and outside shall be thoroughly rubbed with Carborundum stones to remove from marks and other defects, and produce a smooth, uniform finish, no sooner than 24 hours, nor later than 72 hours after the placement of the concrete. In lieu of rubbing the unfinished concrete, the CONTRACTOR may seal the concrete with a sealing compound approved by the ENGINEER.

L. After the concrete has been placed, it shall be protected against the loss of moisture and damage from other adjacent construction operations. The concrete shall be kept wet until forms have been removed. After forms have been removed, the concrete shall be rubbed as specified and then wetted and tightly covered with polyethylene film or other approved curing material for a period of twenty-one (21) days in accordance with ASTM C-309 for curing concrete. It shall be the responsibility of the CONTRACTOR to maintain moisture in the concrete during the specified curing period.

3.05 PATCHING

A. Allow ENGINEER to inspect concrete surfaces immediately upon the removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.

C. Patch imperfections as directed by the ENGINEER.

3.06 DEFECTIVE CONCRETE

A. Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements shall be considered defective.

B. The CONTRACTOR shall repair or replace defective concrete as directed by the ENGINEER.

C. The CONTRACTOR shall not patch, fill, touch up, repair, or replace exposed concrete except upon the express direction of the ENGINEER for each individual area.

3.07 FIELD TESTING CONCRETE

A. Strength Tests During the Work: The OWNER's independent geotechnical testing laboratory will make five concrete test cylinders and perform slump tests at the point where concrete is placed into the forms, for every 50 cubic yards poured or for each day pour, whichever amount of concrete is smaller. Cylinders will be made and tested in accordance with ASTM C-31, ASTM C-172, and ASTM C-39; slump tests will be performed in accordance with ASTM C-143. The standard age of the test shall be 28 days. The first cylinder will be broken at 7 days. If the 7-day break exceeds the specified strength, then no further tests will be made until the 28th day. If the 7-day break does not meet the specified strength, then the second cylinder will be tested on the 14th day. In either event, the remaining cylinder(s) will be tested on the 28th day. When the test cylinders fail to conform to the compressive strength requirements, the ENGINEER shall have the right to order a change in the concrete mix for the remaining portions of the Work at no additional cost to the OWNER. The CONTRACTOR may wish to make additional cylinders at his own expense as verification.

B. Test of Hardened Concrete in or Removed From the Structure: When the results of the strength tests of the control specimens indicate the concrete as placed does not meet specification requirements, or where there is other evidence that the quality of the concrete is below specification requirements, core-boring tests shall be made in conformance with ASTM C-42. Core specimens will be tested by the OWNER's independent geotechnical testing laboratory. All deficiencies shall be corrected, or if the CONTRACTOR elects, he may submit a proposal for approval that load tests be made. If the proposal is approved, the load test shall be made by the CONTRACTOR, and the test results evaluated by the ENGINEER. If any concrete shows evidence of failure during the load test or fails the core test as evaluated, the deficiency shall be corrected. Any deficiency shall be corrected in a manner approved by the ENGINEER, and at no additional cost to the OWNER.

C. During the concrete placement, the OWNER's independent geotechnical testing laboratory shall be responsible for making the test cylinders and performing slump tests. The CONTRACTOR shall furnish the molds, and shall furnish a container suitable to the OWNER's independent geotechnical testing laboratory for storing cylinders in a moist, or saturated condition, at the CONTRACTOR's expense. The OWNER's independent geotechnical testing laboratory shall transport and test the cylinders at no expense to the CONTRACTOR. The cylinders will be tested at the laboratory's designated testing facility.

END OF SECTION

SECTION 03 40 00
PRECAST CONCRETE WETWELL AND VALVE VAULT

PART 1 – GENERAL

1.01 SUMMARY

A. This section addresses the work related to furnishing and installing all supervision, labor, materials and equipment in the work for Precast Concrete Structural Sections, pipe connectors and accessories, placement procedures, and finishes.

1.02 RELATED SECTIONS

A. SECTION 01 60 00 – Product Requirements

B. SECTION 03 15 00 – Concrete Protective Coatings

C. SECTION 03 30 00 – Cast-in-Place Concrete

1.03 SUBMITTALS

A. Submit shop drawings and manufacturers data in accordance with the provisions SECTION 01 33 00 – Submittal Procedures.

B. Copy of Certificate or Report showing that the Precast Concrete Manufacturer conforms to Article 1.4 of this Specification Section.

C. Calculations and Details of Precast Concrete Structural Sections, including buoyancy calculations to be provided and sealed by A Professional Engineer, registered in the State of Alabama, employed by the Manufacturer showing or charting the following:

1. Manufacturer's Part No. or Catalogue No.

2. Inside diameter and height excluding base slab.

3. Wall thickness and base or top thickness where applicable.

4. Handling weight and lifting hole or loop description and locations.

5. Wire size, spacing, location, and steel area provided per vertical foot.

6. Reinforcing bar grade, size, spacing and location.

7. Design load for Flat Slab.

8. Concrete mix number and design strength.

9. Height, width, slope and annular space of the tongue & groove.

D. Pipe Connector Details, Material Specification and pipe installation procedure.

E. Joint Material Details and Material Specifications. Calculations showing the Flexible Joint Sealant cross section is greater than the joints annular space times its height shall be provided when butyl rope internal seals are proposed.

F. Lifting Device and Hole Details that include design loads.

G. Structural analysis and design calculations for Flat Slab Top Precast Components, performed in accordance with the References of this Specification, showing that allowable stresses will not be exceeded. All calculations must be sealed by a Professional Engineer, registered in the State of Alabama, employed by the Precast Concrete Manufacturer.

H. Calculations or test results verifying that the lifting device components and holes are designed in accordance with OSHA Standard 1926.704.

I. Concrete 28 day compression strength results for every day production of Precast Components for the project was performed, showing the required strength according to the guidelines established in ACI 318.

J. Reinforcing and Cement mill reports for materials used in the Manufacture of Precast Components for this project.

K. The above test reports for similar Precast Components recently produced, submitted prior to production of Precast Components for this project.

1.04 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. The referenced publications shall be the current effective edition.

B. Pre-stressed Concrete Institute (PCI)

1. PCI-MNL 116 Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

2. PCI – MNL 120 Design Handbook Precast and Prestressed Concrete

C. National Precast Concrete Association (NPCA)

1. Quality Control Manual for Precast Concrete Plants.

D. American Society for Testing and Materials

1. ASTM A82 – Standard Specifications for Steel Wire, Plain, for Concrete Reinforcement

2. ASTM A416 – Standard Specifications for Steel Strand, Uncoated Seven- Wire for Prestressed Concrete.

3. ASTM A615 – Standard Specifications for Deformed and Plain Carbon- Steel Bars for Concrete Reinforcement

4. ASTM C33 – Standard Specifications for Concrete Aggregates

5. ASTM C260 – Standard Specifications for Air-Entraining Admixtures for Concrete

6. ASTM C361 – Standard Specifications for Reinforced Concrete Low-Head Pressure Pipe

7. ASTM C478 - Standard Specifications for Precast Reinforced Concrete Manhole Sections

8. ASTM C494 – Standard Specifications for Chemical Admixtures for Concrete.

9. ASTM C857 – Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

10. ASTM C881 – Standard Specifications for Epoxy-Resin-Base Bonding Systems for Concrete

11. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures

12. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures

13. ASTM C923 - Standard Specifications for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals

14. ASTM C990 – Standard Specifications for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants

15. ASTM C1037 – Practice for Inspection of Underground Precast Concrete Utility Structures

E. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M198 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

F. American Concrete Institute (ACI)

1. ACI 318 - Building Code Requirements for Structural Concrete and Commentary

2. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary

G. Occupational Safety and Health Administration (OSHA)

1. Standard 1926.704 - Requirements for Precast Concrete Submittals

1.05 QUALIFICATIONS

A. The Precast Manufacturer shall comply with one of the following requirements:

1. Manufacture Precast Components for the project in a plant certified in the Prestressed Concrete Institute's (PCI) Plant Certification Program.

2. Manufacture Precast Components for the project in a plant certified in the National Precast Concrete Association's (NPCA) Plant Certification Program.

3. Retain an independent testing or consulting engineering firm approved by the ENGINEER for Precast Plant Inspection. The basis for Plant Inspection shall be the National Precast Concrete Association Quality Control Manual or the Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products. The above firm shall inspect the Precast Plant two weeks prior to and at one week intervals during production of materials for this project and issue a report, certified by a Professional Engineer, registered in the State of Alabama, that materials, methods, products, and quality control meet the Requirements of the above quality control manuals. Tests and inspections shall be paid by the CONTRACTOR.

B. Concrete compressive strength testing shall be performed in a laboratory inspected by the CCRL of the National Bureau of Standards. Testing shall be performed by Grade I ACI Certified Laboratory Technicians or by Level I PCI Certified Technicians. Testing shall be paid by the CONTRACTOR.

1.06 QUALITY

A. The manufacturer shall be responsible for the performance of all acceptance tests as specified herein and in ASTM C478. In addition, any or all precast concrete products to be installed under this Contract may be inspected at the plant for compliance with these Specifications by the ENGINEER, by an independent testing laboratory provided by the ENGINEER, or by other representative of the ENGINEER. The CONTRACTOR shall require the manufacturer's cooperation in these inspections. The cost of inspection of all products approved for this Contract will be borne by the CONTRACTOR.

B. Care shall be taken in shipping, handling, and installation to avoid damaging the products. Any products damaged in shipment shall be replaced as directed by the ENGINEER.

C. Inspections of the products will also be made by representatives of the ENGINEER after delivery and after installation. The products shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though they may

have been accepted as satisfactory at the place of manufacture. Products rejected after delivery shall be marked for identification and shall be removed immediately from the work site.

D. Any precast concrete product showing a crack or damage or which has received a blow that may have caused an incipient fracture, even though such fracture is barely visible, shall be marked as rejected and immediately removed from the work site. The ENGINEER'S opinion regarding such observations and rejections shall be final.

1.07 INSPECTION, TEST REPORTS, MARKINGS AND SUBMITTALS

A. All precast concrete products to be installed under this contract shall be inspected and tested at the place of manufacture to verify compliance with the Specifications and Drawings.

B. The manufacturer shall perform factory testing as specified herein. Copies of test reports shall be submitted to the ENGINEER before the product is shipped to the project.

C. In the event that any of the test results fail to meet the Specifications, no products represented by such tests shall be shipped to the job site and shall be subject to rejection. The CONTRACTOR may perform additional tests upon the products represented by the failed tests if he desires to verify the accuracy of the original tests. The ENGINEER will review the test results and advise the ENGINEER regarding the suitability of the products.

D. Products, which have been rejected by the ENGINEER, shall not be shipped to the site or shall be removed from the site of the work by the CONTRACTOR and replaced with products, which meet these Specifications and Drawings.

E. Prior to the shipment of each product to the site, the CONTRACTOR shall submit to the ENGINEER test reports and certifications as described below duly certified by the manufacturer's approval testing facility representative or an independent certified testing laboratory demonstrating full compliance with the Specifications and Drawings.

F. An original plus two copies of the following shall be submitted to the ENGINEER.

1. The name, address, and phone number of the product manufacturer and the location of the plant at which it was manufactured.

2. Certification and certified test reports for each product (by number) of the tests performed on concrete and concrete cores showing the results of the tests.

G. Imperfections in and minor damage to the concrete may be repaired with epoxy mortar subject to the approval of the ENGINEER, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Epoxy mortar shall be used for repairs and shall have a minimum compressive strength of 4,000 psi at the end of seven days, and 5,000 psi at the end of 28 days when tested in three-inch by six-inch cylinders stored in the standard manner. No repairs shall

be made until the imperfections or damage has been inspected by the ENGINEER, and repairs authorized in writing. Repairs made prior to such authorization will be cause for rejection of the component. Pieces proposed for repair at the factory shall be set aside for periodic inspection at the factory by the ENGINEER. Inspections will not be made more frequently than once per month. Rejected pieces shall not be shipped to or used for the work.

H. Precast concrete structures may be rejected for any of the following reasons:

1. Exposure of any reinforcement, wires, positioning spacers or chairs used to hold the reinforcement cage in position.

2. Reinforcing steel to be in excess of ½-inch out of the specified position within cores.

3. Any shattering or flaking of concrete.

4. Voids which can be detected on the interior and exterior surfaces exceeding ¼-inch in depth.

5. Unauthorized application of any repair or coating.

6. A deficiency greater than ¼-inch from the specified wall thickness.

7. A variation from the specified internal diameter in excess of 1%.

8. Defects that indicate incorrect molding of concrete or any surface defect indicating honeycomb or other voids.

9. Any of the following cracks:

   a. A crack having a width of 0.005 inches to 0.01 inches throughout a continuous length of 36 inches or more.

   b. A crack having a width of 0.01 inches to 0.03 inches or more throughout a continuous length of 12 inches or more.

   c. Any crack greater than 0.005 inches extending through the wall and having a length in excess of the wall thickness.

   d. Any crack showing two visible lines of separation for a continuous length of two feet or more, or an interrupted length of three feet or more anywhere in evidence both inside and outside.

   e. Any crack anywhere greater than 0.03 inches in width.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Concrete shall conform to ASTM C478 and as follows:

1. Compressive strength: 4000 psi minimum at 28 days.

2. Air Content: 6% +/- 2%.

3. Alkalinity: Minimum of 50% calcium carbonate equivalent for bases, risers, and cones.

4. Cementitious Materials: Minimum of 470 pounds per cy

5. Coarse Aggregates: ASTM C33. Sound, Crushed, Angular Limestone. Smooth or rounded stone shall not be used.

6. Fine Aggregates: ASTM C33. Free from organic impurities.

7. Chemical Admixtures: ASTM C494. Calcium Chloride or admixtures containing calcium chloride shall not be used.

8. Air Entraining Admixtures: ASTM C260.

B. Reinforcing steel shall be ASTM A615 grade 60 deformed bar, ASTM A82 wire or ASTM A185 welded wire fabric.

C. Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars are not allowed.

D. Flexible Joint Sealants shall be butyl rubber based conforming to AASHTO M-198, Type B - Butyl Rubber and as follows: maximum of 1% volatile matter and suitable for application temperatures between 10 and 100 degrees F.

E. The outside of all below-grade joints shall be sealed with an eight-inch-side, adhesive butyl rubber sealant strip with Ethylene Propylene Diene Monomer (E.P.D.M.) rubber backing. (ASTM C-990-98, Paragraph 6.2) The strip shall be installed only after the non-shrink grout has cured at least 72 hours and the surface has been prepared and primed in accordance with the manufacturer's printed directions.

1. CONTRACTOR shall obtain concurrence of ENGINEER's Inspector regarding the adequacy of concrete surface preparation before applying butyl rubber sealant strip.

F. Epoxy Gels for interior patching of wall penetrations shall be a 2-component, solvent-free, moisture-insensitive, high modulus, high-strength, structural epoxy paste adhesive meeting ASTM C-881, Type I and II, Grade 3, Class B and C, Epoxy Resin Adhesive.

2.02 COMPONENTS

A. Precast Component Fabrication and Manufacture shall be as described in this paragraph and as described in the paragraphs for the specific components.

1. Precast Manufacturing shall be in conformance with ASTM C478. Wall and inside slab finishes resulting from casting against forms standard for the industry will be acceptable. Exterior slab surfaces shall have a float finish. Small surface holes, normal color variations, normal form joint marks, and minor depressions, chips and spalls will be tolerated. Dimensional tolerances shall be those set forth in the appropriate References and specified below.

2. Joint Surfaces between Bases and Risers shall be manufactured to the joint surface design and tolerance requirements of ASTM C361. The maximum slope of the vertical surface shall be 2°. The maximum annular space at the base of the joint shall be 0.10 inches. The minimum height of the joint shall be four inches.

3. Lift Inserts and Holes shall be sized for a precision fit with the lifting devices, shall comply with OSHA 1926.704, and shall not penetrate through the structure wall.

B. Precast Base Sections shall be cast monolithically without construction joints or with an approved galvanized or PVC waterstop in the cold joint between the base slab and the walls. The width of the base extensions on Extended Base Structures shall be no less than the base slab thickness.

C. Precast Riser Sections shall have a minimum height of 16 inches.

D. Precast Flat Slab Top Sections shall be designed for HS-20 traffic loadings as defined in ASTM C890. Items to be cast into Special Flat Slab Tops shall be sized to fit within the structure ID and the top and bottom surfaces.

E. Pipe to Precast Structure Connectors shall conform to ASTM C923. The location of the pipe connectors shall vary from the location shown on the Project Plans no more than 1/2 inch vertically and 5 degrees horizontally.

F. Joints between Precast Components shall be sealed internally between the tongue and the groove and additionally around the external perimeter as follows:

1. External Seals shall consist of an E.P.D.M. rubber backed flat butyl rubber sheet no less than 1/16-inch thick and eight inches wide applied to the outside perimeter of the joint.

2. Internal Seals shall consist of a plastic or paper-backed butyl rubber rope having a cross-sectional area no less than the annular space times the height of the joint.

G. Lifting devices for handling Precast Components shall be provided by the Precast Manufacturer and shall comply with OSHA Standard 1926.704.

2.03 CONFIGURATION

A. Precast structures are to be constructed as shown on the drawings.

B. The number of joints shall be minimized.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Inspect Precast Structure Components prior to unloading from the delivery truck.

3.02 PREPARATION

A. Product Delivery, Storage, and Handling: Coordinate delivery with the manufacturer, handle and store the Precast Components in accordance with ASTM C891 and the manufacturer's recommendations using methods that will prevent damage to the components and their joint surfaces.

3.03 PLACING STRUCTURE SECTIONS

A. Excavate to the required depth and remove materials that are unstable or unsuitable for a good foundation. Prepare a level, compacted foundation extending six inches beyond the precast structure and any added extended base.

B. Set base plumb and level.

C. Set risers, taking particular care to clean, prepare and seal joints.

D. After joining structure sections, apply the butyl sealant sheet around the outside perimeter of the joint.

E. Lift Holes leaving less than two inches of wall thickness shall be plugged from the outside using a sand cement mortar, then covered with butyl sealant sheet. Lift Holes penetrating the wall shall be additionally sealed with an interior application of an epoxy gel 1/8-inch thick extending two inches beyond the penetration.

F. Perform the final finishing of the precast structure's interior by filling all chips or fractures greater than ½-inch in length, width or depth and depressions more than ½- inch deep with a sand cement mortar. Do not fill the joints between the precast concrete sections. Clean the interior of the structure, removing all dirt, spills or other foreign matter.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This section addresses the work related to furnishing and installing all supervision, labor, materials and equipment in the work for flexible, adhesive sealants, bedding and related materials.

1.02 RELATED SECTIONS

A. SECTION 01 60 00 – Product Requirements

B. SECTION 03 30 00 – Cast in Place Concrete

1.03 SUBMITTALS

A. Submit shop drawings and manufacturer's data in accordance with the provisions of SECTION 01 33 00 – Submittal Procedures.

1. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, color availability and intended use.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in applying the work of this Section with minimum five years' documented experience.

B. Conform to Sealant and Waterproofers Institute requirements for materials and installation.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with all work with exposed and hidden surfaces requiring sealants.

1.07 DEFINITIONS

A. Regardless of the terminology used on the drawings the following definitions shall be used to identify and clarify the use of materials specified.

B. "Caulking" may apply only to oil based and other organic materials and work in connection with them. Use in the filling or closing of interior joints where expansion or contraction are of no consideration, and where filling and closing of these interior joints is primarily for appearance, or painting.

C. "Sealant" shall apply to all other conditions, interior and exterior, where either expansion, contraction, resiliency, and waterproof or weather tight construction is a consideration.

1.08 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. The referenced publications shall be the current effective edition.

B. ASTM International (ASTM)

1. ASTM C509 - Elastomeric Cellular Preformed Gasket and Sealing Material

2. ASTM C834 – Latex Sealants

3. ASTM C920 – Standard Specification for Elastomeric Joint Sealants

4. ASTM D1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber

5. ASTM C1193 – Standard Guide for Use of Joint Sealants

C. UNITED STATES FEDERAL SPECIFICATIONS

1. TT-S-01657 – Sealing Compound: Silicone Rubber Base (For Calking, Sealing, and Glazing in Buildings and Other Structures

PART 2 – PRODUCTS

2.01 SEALANTS

A. Sealant for Exterior Work including roof flashing, perimeter of exterior doors and louvers (except as specified otherwise) Single component polyurethane, ASTM C- 920 type W, grade NS, class 25, use NT, M, A:

B. Polyurethane Sealant for use in masonry control joints and expansion joints and interior work except as noted elsewhere: ASTM C920, Class A, single component, chemical curing, non-staining, non-bleeding, self-leveling type.

C. Butyl Sealant for threshold setting bed: Single component, solvent release, non- skinning, non-sagging, TT-S-01657 type I.

D. Color: Match adjacent surfaces where not painted, or as otherwise selected by the CITY from manufacturer's standard colors.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

2.03 JOINT BACKING

A. Closed cell polyethylene rod, circular or rectangular dimension as indicated or required; or bond-breaking type coated open cell polyurethane rod. Materials shall be free of oil or other staining elements. Oakum and other types of absorptive materials shall not be used.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that surfaces, and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing surfaces & substrate.

C. Coordinate installation with pre-finished surfaces or surfaces requiring painting.

3.02 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance with ASTM C3111 for solvent release, C1193 for latex base sealants.

E. Protect elements surrounding the work of this Section from damage or disfiguration.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

D. Install bond breaker where joint backing is not used.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints as detailed or as appropriate.

3.04 CLEANING AND REPAIRING

A. Clean adjacent soiled surfaces.

B. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished installation in accordance with the manufacturer’s recommendations.

B. Protect sealants until cured.

END OF SECTION

SECTION 08 11 00
HATCHES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This section addresses the work related to furnishing and installing all supervision, labor, materials and equipment in the work for metal fabrications including hatches for installation on both the interior and exterior of a pumping station.

1.02 Related Sections

A. SECTION 01 60 00 – Product Requirements

B. SECTION 03 30 00 – Cast-in-Place Concrete

1.03 SUBMITTALS

A. Submit shop drawings and manufacturers' data in accordance with the provisions of SECTION 01 33 00 – Submittal Procedures.

1.04 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. The referenced publications shall be the current effective edition.

B. ASTM International (ASTM)

1. ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperatures or High Pressure Service and Other Special Purpose Applications

2. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes

3. ASTM B108 – Standard Specification for Aluminum-Alloy Permanent Mold Castings

4. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

5. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

6. ASTM D1187 – Asphalt-Base Emulsions for Use as Protective Coatings for Metal

PART 2 – PRODUCTS

2.01 HATCHES

A. Load Rating: 300 pounds per square foot.

B. Frame:

1. Material: Extruded aluminum with mitered and welded corners.

2. Anchors: Continuous type or bolt-on strap type.

3. Provide frame with built-in neoprene gasket.

4. Apply a bituminous coating to surfaces of frame that will be in contact with concrete.

C. Cover:

1. Material: 1/4 inch mill finish one piece aluminum diamond plate, reinforced with stiffening ribs

2. Hinges: Stainless steel; cam-action type with torsion bars.

3. Hold Open Arm: Stainless steel; automatically locks door at 90 degree position; provide aluminum grip handle to release door for closing.

4. Lock: Stainless steel; slam type with fixed handle inside and removable key wrench outside. Provide lock hasp.

5. Maximum allowable deflection less than length of span/180 or 0.25 inches, whichever is less.

D. Hardware and Fasteners: Type 316 stainless steel.

E. Accessories: Provide one key wrench for each door supplied.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install hatches in accordance with manufacturer's published instructions.

END OF SECTION

SECTION 09 91 13
BELOW GRADE EXTERIOR WATERPROOFING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This section addresses the work related to furnishing and installing all supervision, labor, materials and equipment in the work for installing waterproof coating for exterior concrete wall surface below grade.

1.02 RELATED SECTIONS

A. SECTION 01 60 00 – Product Requirements

B. SECTION 03 30 00 – Cast-in-Place Concrete

C. SECTION 03 40 00 – Precast Concrete Wet Wells and Valve Vaults

1.03 SUBMITTALS

A. Submit shop drawings and manufacturers data in accordance with the provisions of SECTION 01 33 00 – Submittal Procedures, and

1. Manufacturer's Instructions: Indicate special surface preparation procedures, and substrate conditions requiring special attention.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container label shall include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Store materials at a minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the product manufacturer.

C. Minimum Application Temperatures: 45 degrees F unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 – PRODUCTS

2.01 PRODUCTS

A. Acceptable products shall be Belzona 4211 Magma Stop and Belzona 4211 Magma Seal by Belzona, Inc.; Bitumastic 2CB, Special Surface Conditioner for 300M and 300M Coal Tar Epoxy by Kopper's; or equal.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

A. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit a loose surface or other defects.

3.03 APPLICATION

A. The CONTRACTOR shall be responsible to coordinate and provide all required substrate preparation of the pump station as required for the satisfactory installation of the coating system.

B. Apply products in accordance with manufacturer's instructions.

C. Do not apply finishes to surfaces that are not dry.

D. Apply each coat to uniform finish. Number and thickness of coats shall be in accordance with manufacturer's recommendations.

E. Brush, roll-on or spray. Spray shall be induction type pump with 20 to 30 psi air pressure on liquid and 50 psi minimum on the gauge.

F. Thinners: Not allowed.

G. Allow applied coat to dry before next coat is applied. Drying time shall be in accordance with manufacturer's recommendations.

3.04 CLEANING

A. Clean drips and spills upon occurrence. Remove material applied to surfaces not scheduled to be coated and refinish surface if damaged.

B. Collect waste material, which may constitute a fire hazard, place in closed metal containers and remove daily from site.

END OF SECTION

SECTION 09 97 23
PROTECTIVE COATING FOR EXISTING AND NEW CONCRETE AND MASONRY SANITARY SEWER STRUCTURES

PART 1 – GENERAL

1.01 GENERAL

A. This specification covers labor, materials, and equipment required for protecting and/or rehabilitating the interior of concrete sanitary sewer structures by application of a coating to protect the concrete structure from hydrogen sulfide and acid generated by microbiological sources present in the municipal wastewater environment. The protective coating shall also eliminate infiltration, repair voids, and enhance the structural integrity of the sanitary sewer structure. Procedures for surface preparation, cleaning, application and testing are described herein.

B. Cementitious material will not be allowed for the protective coating, however, it will be allowed for patching operations.

C. For new sanitary sewer manholes and valve pits: The protective coating shall be an acrylic polymer-base concrete coating and sealant. Procedures for surface preparation and application are described herein.

D. For force main discharge manholes (including the two (2) manholes downstream of the discharge manhole, for a total of three (3) manholes), drop manholes and lift station wetwells: The protective coating shall be a polymer based polyurethane or a high-build, solvent-free epoxy coating. For small lift stations and at the discretion of the OWNER, the number of manholes requiring coating may be reduced.

E. For lift station wetwells, the coating limits shall include from the bottom of fillet, wetwell walls, and roof. Coating system shall overlap 1" to 2" where hatches sit on the roof; but shall exclude the wetwell floor. For manholes, the coating limits shall include from the flow line in the trough of the invert up to the ring with a 1" to 2" overlay on the ring.

F. This specification also covers labor, materials, and equipment required for corrosion protection of the ductile iron discharge pipes and fittings within lift station wetwells.

1.02 REFERENCES

A. ASTM D638 - Tensile Properties of Plastics.

B. ASTM D790 - Flexural Properties of Unreinforced/Reinforced Plastics.

C. ASTM D695 - Compressive Properties of Rigid Plastics.

D. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gauges

E. ASTM D4541 - Pull-off Strength of Coatings Using a Portable Adhesion Tester.

F. ASTM D2584 - Volatile Matter Content.

G. ASTM D2240 - Durometer Hardness, Type D.

H. ASTM D543 - Resistance of Plastics to Chemical Reagents.

I. ASTM C109 - Compressive Strength Hydraulic Cement Mortars.

J. ACI 506.2-77 - Specifications for Materials, Proportioning, and Application of Shotcrete.

K. ASTM C478 - Bond Strength to Concrete: Concrete Failed.

L. ASTM C496 - Tensile Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars.

M. ASTM C579 - Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars.

N. ASTM - The published standards of the American Society for Testing and Materials, West Conshohocken, PA.

O. NACE - The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX.

P. SSPC - The published standards of the Society of Protective Coatings, Pittsburgh, PA.

Q. ASTM C396 - Compressive Strength of Cement Mortars.

R. ASTM C580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concrete.

S. ASTM D4541 - Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.

T. ASTM D4787 - Standard Practice for Continuity Verification of Liquid or Sheet Depth Applied to Concrete Substrates.

1.03 SUBMITTALS

A. Product Data:

1. Technical data sheet on each product used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

2. Material Safety Data Sheets (MSDS) for each product used.

3. Project specific guidelines and recommendations.

4. Warranty Certificate in accordance with Part 1.08 of this Section.

5. For Lift Station Wetwells:

    a. Provide reference documentation to confirm that the proposed coating system has a proven record of performance when used in the intended application, including a list of at least five (5) successful installations that have been in service for a period of ten (10) years. The reference list shall include the name of the facility, the application date, a contact person, and a telephone number.

    b. Applicator Qualifications:

        1) Manufacturer certification that Applicator has been trained and approved in the handling, mixing and application of the products to be used.

        2) Certification that the equipment to be used for applying the products has been manufactured or approved by the concrete rehabilitation products manufacturer, protective coating manufacturer, and certified for proper use for this specific application.

        3) Written documentation of four (4) recent references of Applicator (involving wetwells with surface area of approximately 3,000 square feet) indicating successful application of a polyurethane or a high-build solvent-free epoxy coating.

        4) Applicator must provide written documentation of having installed a minimum of 40,000 square feet of protective coating similar to that specified within the last two (2) years.

        5) Any project specific guidelines for the project.

        6) Design details for any additional ancillary systems and equipment to be used in site and surfaced preparation, application and testing.

1.04 QUALITY ASSURANCE

A. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the protective coating manufacturer's recommendations.

B. Coating Manufacturer's authorized field representative shall be on site prior to the application of the coating system to verify that the substrate has been properly prepared, and during the application of the coating system to certify that the coating system has been properly applied. The authorized field representative will provide the OWNER with an accurate and objective written report stating inspection observations on the preparation, application, and final inspection verifying adherence to coating manufacturer recommendations, industry standards, and the written specifications.

1.05 DELIVERY, STORAGE, AND HANDLING

A. All materials are to be kept dry, protected from weather and stored under cover.

B. Protective coating materials are to be stored according to manufacturer's recommendations. Do not store near flame, heat or strong oxidants.

C. Repair and protective coating materials are to be handled according to their material safety data sheets.

1.06 SITE CONDITIONS

A. Applicator shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA and the EPA and any other applicable authorities.

B. Method statements and design procedures are to be provided by the CONTRACTOR when confined space entry is required.

C. During coating operations of existing manholes and lift station wetwells, CONTRACTOR shall provide temporary flow bypassing of the structure if required by the OWNER.

1.07 ACCESS TO THE WORK SITE

A. CONTRACTOR shall provide proper facilities for such access and observation of the Work and also for any inspection or testing by others. If any Work is covered contrary to the request of the OWNER or ENGINEER, it must, if requested by the OWNER or ENGINEER's Representative, be uncovered for observation and replaced at the CONTRACTOR's expense.

B. CONTRACTOR shall provide access to site inspection.

1.08 WARRANTY

A. Sanitary Sewer Manholes and Valve Pits:

1. All materials and workmanship shall be warranted to the OWNER for five (5) years.

B. Force Main Discharge Manholes, Drop Manholes and Lift Station Wetwells:

1. Materials

a. The topcoat manufacturer shall warrant the manufacturer's materials used on wastewater structures against failure of the system resulting in biogenic corrosion caused by exposure to sanitary sewer environment for the period of ten (10) years from the date of certified inspection and acceptance by the OWNER. Within sixty (60) days of receiving written notice from the OWNER, the manufacturer shall replace any defective product and the approved application CONTRACTOR shall repair defects in materials and/or workmanship which may develop during the warranty period.

2. Application

a. The applicator shall warrant that all coating work performed shall be free of significant defects in materials and/or workmanship for a period of ten (10) years from the date of certified inspection and final acceptance by the OWNER. Applicator shall remove, replace, or repair as he/she deems appropriate, such defective work.

3. Bypassing

a. In the event of liner failure, the OWNER's Conveyance Department shall assist application CONTRACTOR to make the necessary repairs by bypassing the structures to be repaired. The OWNER shall not bear any additional costs of coating repairs, such as dewatering and cleaning structures, providing coating underlayment or top coat materials, or applying the coating system.

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

A. Cementitious patching, repair, and structural restoration materials used shall be only those specified and pre-approved. Project specific submittals shall be provided including application, cure time and surface preparation procedures which permit optimum bond strength with protective coating.

B. Repair materials shall be used to fill voids, structurally reinforce and/or rebuild substrate surfaces, etc. as determined necessary by the ENGINEER and protective coating applicator. Quick blending, rapid setting, high early strength, fiber reinforced, non- shrink repair mortar that can be trowelled or pneumatically spray applied must be compatible with the specified protective coating and shall be applied in accordance with the manufacturer's recommendations.

C. The following products are accepted and approved as compatible repair basecoat materials for protective top coating for use within the specifications.

1. Infiltration Control

a. All fast setting materials furnished shall be applied directly to active leaks under hydrostatic pressure from the exterior of the concrete in wetwell structures or control by dewatering methods. Materials shall consist of rapid setting cements and various accelerating agents. Material shall not contain chlorides, gypsum, or metallic particles.

b. Should groundwater be encountered, CONTRACTOR shall be responsible for utilizing a dewatering system(s) to remove water from the excavations.

2. Repair, patching, and structural restoration

a. All material furnished shall be designed to fill voids and to repair or reconstruct where no hydrostatic pressure exists. Material shall consist of rapid setting cements, NSG aggregates, and various accelerating agents. Material shall not contain chlorides, gypsum, or metallic particles.

b. All structural restoration materials shall be specifically designed for the rehabilitation of wastewater pump station wetwells and other related concrete structures. Materials shall contain poly fiber reinforcement, fused calcium aluminate, and chemical admixtures.

D. Structural Restoration Material Properties:

Product types	Fused Calcium Aluminate Cement OR Underlayment concrete approved by top coat system manufacturer
Cure Time	< 48 hours
Curing Gases	Non-toxic
Compressive Strength	5,000 psi
Tensile Strength	500 psi
Flexural Strength	600 psi
Shrinkage	0% at 90% Relative Humidity

2.02 SANITARY SEWER MANHOLES AND VALVE PITS

A. Interior and Exterior Coating Material

1. The interior and exterior of all manhole and valve pit structures shall be coated with three coats of a factory or field applied acrylic polymer-base concrete coating and sealant that is neither asphalt nor coal tar based. Acceptable coating is ConSeal CS-55, colors gray or black, as manufactured by Concrete Sealants, New Carlisle, Ohio or equal. The total dry film thickness shall be 3.5 mils. Coating shall be applied to the tongue and groove area of the manhole and valve pit sections as well.

B. The coating manufacturer and applicator shall inspect and certify all coatings prior to the coated pre-cast structures leaving the precast facility.

2.03 FORCE MAIN DISCHARGE MANHOLES, DROP MANHOLES, AIR RELEASE VALVE MANHOLES & LIFT STATION WETWELLS

A. Structural Restoration & Coating Products:

1. Raven Lining Systems Products

2. Sauereisen Lining Products

3. Spectrashield Liner System Products

4. Or approved equal (2) weeks prior to bid date

B. Protective Coating Material:

Product type	Polyurethane or solid Epoxy
Color	Light
Compressive Strength	15,000 psi
Tensile Strength	1,500 psi
Hardness	Type D 60
Bond Strength – Concrete	> Tensile Strength of Concrete
Dry Film Thickness	125 mils

2.04 APPLICATION EQUIPMENT

A. Structural restoration mortars and protective coatings shall be applied with manufacturer approved equipment.

PART 3 - EXECUTION

3.01 ACCEPTABLE APPLICATORS

A. Repair mortar must be applied by manufacturer trained and approved applicators. The repair mortar shall be applied according to manufacturer's recommendations.

B. Protective coating must be applied by a Certified Applicator of the protective coating manufacturer and according to manufacturer specifications.

3.02 EXAMINATION

A. Appropriate actions shall be taken to comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety.

B. All bidders are required to verify that they have visited the jobsite, and are familiar with the conditions and the entire scope of work. Bidders shall field verify the attached plans and perform their own quantity measurements prior to bidding.

1. CONTRACTOR shall provide a minimum 24 hour notice to the COS Inspector / Representative for the following conditions:

2. After final surface preparation is completed but before structure rehabilitation;

3. After patching operations have cured, and

4. After each coating layer is applied.

C. Installation of the protective coating shall not commence until the concrete substrate has properly cured in accordance with these specifications.

D. Temperature of the surface to be coated should be maintained between 60° F and 100° F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying

surface temperatures do exist, care should be taken to apply the coating when the temperature is falling versus rising (i.e., late afternoon into evening vs. morning into afternoon).

3.03 SURFACE PREPARATION

A. Applicator shall inspect all surfaces specified to receive a protective coating prior to surface preparation. The existing piping, valves, and appurtenances shall be protected during structural rehabilitation and protective coating application.

B. The pipes and connectors are to be top coated with 30-50 mils DFT nominal. The pipes and connectors are to be primed by the fabricator with epoxy primer (not cold-tar or asphaltic base) that is compatible with the protective coating. After installation, the pipes are to be pressure washed using at a minimum 5,000 PSI and 4 GPM washer and/or abrasive blast cleaned to an SSPC-SP7 'brush-off' specification as necessary for the window of overcoating of the primer.

C. Wetwell piping and connectors coated with the Zinc/Epoxy exterior coating system shall not require top coating unless otherwise directed by the ENGINEER or OWNER.

D. All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.

E. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

F. Old concrete must be firm and structurally sound as specified by the ENGINEER.

G. Surface preparation method(s) should be based upon the conditions of the substrate, service environment and the requirements of the protective coating to be applied.

H. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate. At a minimum, this will be achieved with a low pressure water cleaning equipment using a 0 degree rotating nozzle at a minimum 3,500 psi and 4 GPM. Other methods such as high pressure water jetting (refer to NACE Standard No. 6 /SSPC-SP 13), abrasive blasting, shot-blasting, grinding, scarifying and/or acid etching may also be used. In addition, detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. The method(s) used shall be performed in a manner that provides a uniform, sound clean, neutralized surface that is not excessively damaged.

3.04 APPLICATION OF REPAIR MATERIALS

A. Areas where structural steel has been exposed or removed shall be repaired in accordance with the Project ENGINEER's recommendations.

B. Repair/Structural Restoration materials shall meet the specifications here and as described in part 2.01 A of these specifications. The materials shall be applied utilizing proper

equipment on to specified surfaces. The structural restoration material shall match the original undamaged surface.

C. Infiltration shall be stopped by using a material which is compatible with the specified repair mortar, waterproof quick setting mortar-type that is suitable for topcoating with the specified protective coating. CONTRACTOR shall completely identify the types of grout, mortar, and sealant for repair of leak defects and provide case histories of successful use.

D. Infiltration areas that require crack injection shall be covered in this scope of work. Injection holes shall be drilled through the wetwell at 120° angles from each other at the same plane of elevation. Rows shall be separated no more than three vertical feet, and the holes shall be staggered with the holes in the rows above and below. Provide additional injection holes near observed defects and pipe seals. A minimum of 6 injection holes shall be provided per defect.

E. Grout shall be injected through holes under pressure with a suitable probe. Injection pressure shall not cause damage to the wetwell structure or surrounding surface features. Grout shall be injected through the lowest holes first. Grouting from the ground surface will not be allowed. Provide additional injection holes if necessary to ensure grout travel, verified by field observation of grout at adjacent defects or holes. Patch injection holes using a waterproof quick setting mortar after cleaning with a drill.

F. The approved repair materials shall provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating. No bug- holes or honeycomb surfaces should remain after the final trowel procedure of the repair mortar.

G. The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds should not be used unless approved for compatibility with the specified protective coating.

H. After required cleaning and repair is performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast, shot-blast or other approved method. If repair materials are used, refer to these specifications for surface preparation. Areas to be coated must also be prepared in accordance with these specifications after receiving a repair mortar and prior to application of the protective coating.

3.05 APPLICATION OF PROTECTIVE COATING

A. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

B. The equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.

C. The protective coating material must be applied by an applicator certified by the protective coating manufacturer.

D. Specified surfaces shall be coated by a moisture tolerant, solvent-free, protective coating properties as described in these specifications.

E. Application equipment approved by the coating manufacturer shall be used to apply each coat of the protective coating. If necessary, subsequent topcoating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, ideally within 12 hours but no later than the recoat window for the specified products. Additional surface preparation procedures will be required if this recoat window is exceeded.

3.06 TESTING AND INSPECTION

A. During application a wet film thickness gage meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a uniform thickness during application.

B. After the protective coating has set hard to the touch it shall be inspected with high- voltage holiday detection equipment meeting ASTM D4787 – Standard Practice for Continuity Verification of Liquid or Sheet Depth Applied to Concrete Substrates. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch- up/repair procedures, for areas that do not meet the specified thickness, shall follow the protective coating manufacturer's recommendations.

C. An SSPC Certified Coatings Inspector or NACE Certified Coatings Inspector must be present and monitor the holiday testing (and repairs, if necessary). The final inspection report is to include the holiday testing results.

D. A final visual inspection shall be made by the Inspector and manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Applicator.

END OF SECTION

SECTION 22 05 23
GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Valves, General
2. Gate Valves
3. Balancing Valves
4. Ball Valves
5. Swing Check Valves
6. Backflow Prevention Assemblies
7. Pressure Regulating Valve-Domestic Water
8. Thermostatic Master Mixing Valves (ASSE 1017 Rated)
9. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated)

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.

B. Valves, General:

1. Apollo
2. Armstrong
3. ASCO
4. Cla-Val
5. Conbraco
6. Crane

7. Clow
8. Griswold
9. Hammond
10. Hays
11. Jenkins
12. Josam
13. Kennedy
14. Milwaukee
15. Mueller
16. Nibco
17. Red-White Valve
18. Smith
19. Stockham
20. Tour Anderson
21. Wade
22. Watts
23. Wilkins
24. Zurn
25. Or approved equivalent.

C. Gate Valves:

1. See Valves General above.

D. Balancing Valves:

1. Caleffi
2. Griswold

3. Hays

4. Armstrong CBV

5. Tour Anderson

6. Or approved equivalent.

E. Ball Valves:

1. See Valves General above.

2. NSF Valves:

a. Clow

b. Kennedy

c. Nibco

d. Or approved equivalent.

F. Swing Check Valves:

1. See Valves General above.

G. Backflow Prevention Assemblies:

1. Backflow Preventers:

a. Apollo

b. Cla-Val

c. Conbraco

d. Watts

e. Or approved equivalent.

2. Backflow Prevention Assemblies - Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications - 2-inches and Smaller:

a. Febco 860-with 650A.

b. Conbraco 40-210-AGD.

c. Wilkins 375-XL-SAG.

d. Watts 919-QT-S valve with 919AGC or 919AGF.

e. Or approved equivalent.

3. Backflow Prevention Assemblies - Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications - 2-1/2-inches and Larger:

a. Febco 860 with 758A.

b. Conbraco Apollo 40-700 with 758A.

c. Watts 909-S-NFA-NRS with AGC.

d. Wilkins 375-FSC.

e. Or approved equivalent.

4. Backflow Prevention Assemblies - Double Check Valve Assembly (DCVA) for Low Hazard Applications - 2-inches and smaller:

a. Febco 850-650A

b. Conbraco Apollo 40-110-T2

c. Watts 007-QT-FDA-S

d. Wilkins 350-S-XL

e. Or approved equivalent.

5. Backflow Prevention Assemblies - Double Check Valve Assembly (DCVA) for Low Hazard Applications - 2-1/2-inches and larger:

a. Conbraco Apollo 45-11-1

b. Watts 709-DCDA with 77F-01-FDA-12

c. Or approved equivalent.

6. Spill Resistant Pressure Vacuum Breaker:

a. Febco

b. Conbraco

c. Watts

d. Wilkins

e. Or approved equivalent.

7. Atmospheric Vacuum Breakers:

a. Febco

b. Conbraco

c. Watts

d. Wilkins

e. Or approved equivalent.

H. Pressure Regulating Valve-Domestic Water:

1. Cash Acme

2. Cla-Val

3. Watts

4. Wilkins

5. Or approved equivalent.

I. Thermostatic Master Mixing Valves (ASSE 1017 Rated):

1. Holby Tempering Valve

2. Lawler Series 66

3. Leonard Type TM

4. Powers LFMM430 (Lead Free)

5. Symmons Temp Control Series 5

6. Or approved equivalent.

J. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated):

1. Lawler

2. Leonard

3. Powers Hydroguard

4. Or approved equivalent.

2.02 VALVES - GENERAL

A. General:

1. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

2. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves 6-inches and smaller. Provide gear operators for quarter-turn valves 8-inches and larger and plug valves installed over 5-feet above finished floor.

3. Valve Identification: Manufacturer's name (or trademark) and pressure rating clearly marked on valve body.

B. Valves in Insulated Piping: With 2-inch stem extension and following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation on valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.

C. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.

2. Solder Joint: With sockets according to ASME B16.18.

3. Threaded: With thread according to ASME B1.20.1.

D. Valve Bypass and Drain Connections: MSS SP-45.

E. Building Service:

1. Shutoff and Isolation Valves:

a. Pipe Sizes 3-inches and Smaller: Ball Valve.

2. Drain Service: Ball Valves

3. Strainer Blow-Off: Ball Valve

4. Check Valves: Swing

2.03 GATE VALVES

A. Gate Valves - Class 125:

1. 2-inches and Smaller: MSS SP-80, Class 125, ASTM B62 cast bronze composition body, bonnet and solid disc, copper-silicon non-rising stem, brass packing gland, Teflon impregnated packing and malleable iron hand-wheel.

2. 2-1/2-inches and Larger: MSS SP-70, Class 125, ASTM A126 Grade B Ductile iron body, bolted bonnet and disc, bronze trim, copper silicon non-rising stem, bronze packing gland, Teflon impregnated packing and malleable iron hand-wheel.

B. Gate Valves - Class 150:

1. 2-inches and Smaller: Class 150, MSS SP-80, ASTM B62 cast bronze body, bronze bonnet, bronze wedge, non-rising stem, brass packing gland, non-asbestos packing and aluminum or malleable iron hand-wheel.

2. 2 1/2-inches and Larger: Class 150, MSS SP-70, ASTM A126 Grade B, IBBM, ductile iron body, bonnet and wedge, bronze trim, non-rising stem, brass packing gland, non-asbestos packing and cast iron hand-wheel.

C. Gate Valves - Class 250:

1. 2-inches and Smaller: Class 250, SWP, MSS SP-80, ASTM B61, cast bronzed body, bronze bonnet, bronze wedge, non-rising stem, bronze packing gland, non-asbestos packing and aluminum or malleable iron hand-wheel.

2. 2 1/2-inches and Larger: Class 250, SWP, MSS, SP-70, ASTM A126, Grade B cast iron body, cast iron bonnet, cast iron wedge, bronze trim, non-rising stem, brass packing gland, non-asbestos packing and cast iron hand-wheel.

2.04 BALANCING VALVES

A. Maximum 125 PSIG System Working Water Pressure.

B. Manual Set Balancing Valves:

1. Valves are to be of the "Y" pattern, equal percentage globe-style and provide three functions:

a. Precise flow measurement.

b. Precision flow balancing.

c. Positive drip-tight shut-off.

2. Valve to provide multi-turn, 360 degree adjustment with micrometer type indicators located on the valve handwheel. Valves have a minimum of five full 360 degree

handwheel turns. 90 degree circuit-setter style ball valves are not acceptable. Valve handle to have hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valves to be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi to have two 1/4-inch threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves to be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug to be brass. The handwheel to be high-strength resin.

3. 2-1/2-inch and Larger: Valves are to be of the "Y" pattern, equal percentage globe-style and provide three functions:

    a. Precise flow measurement.

    b. Precision flow balancing.

    c. Positive drip-tight shut off. Valve to provide multi-turn, 360 degree adjustment with micrometer type indicators location on the valve handwheel. Valves to have a minimum of five full 360 degree handwheel turns. 90 degree circuit-setter style ball valves are not acceptable. Valve handle to have hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valve body to be either cast iron with integrated cast iron flanges (2-1/2-inch to 12-inch) or ductile iron with industrial standard grooved ends (2-1/2-inch to 12-inch). Valve stem and plug disc to be bronze with handwheel that permits multi-turn adjustments. Sizes 2-1/2-inch and 3-inch - five turns, sizes 4-inch to 6-inch - 6 turns, sizes 8-inch to 10-inch - 12 turns and size 12-inch - 14 turns. Flange adapters to be provided to prevent rotation.

C. Automatic Flow Control Valve:

1. 1/2-inches and Larger: Construction and attachment style as required by piping system. Internal working parts and removable flow cartridge stainless steel. Valves to be factory set and automatically limit flow to specified capacities with 5 percent plus or minus accuracy over entire operating pressure differential.

2. Provide shut-off valve of supply side of valve and check valve on discharge side of valve.

3. Minimum Flow Through Valve:

    a. 1/2-inches size: 1 gpm.

    b. 3/4-inches size: 1.5 gpm.

2.05 BALL VALVES

A. All ball valves on brazed piping are to be three-piece.

B. 2-1/2 Inches and Smaller: MSS SP-110, 400-600 PSI, two-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 77CLF 100 Series two-piece.

C. 3 Inches and Larger: MSS SP-110, 400-600 PSI, three-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 82- 100/82A 140 Series three-piece.

D. Full Port Ball Valve: 2- to 4-inch ductile iron, ASTM A536, micro finish steel chrome plated or stainless steel ball and stem. TFE seats, 600 PSI.

2.06 SWING CHECK VALVES

A. 2-inches and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc. Nibco 413. MSS SP-80.

B. 2-1/2-inches and Larger: Class 125, iron body, bolted bonnet, horizontal swing, renewable seat and disc, flanged ends. Nibco F918. MMS SP-71.

C. Rubber Flapper Check Valve: Horizontal or vertical upward flow installation. Working pressure to 175 PSI. Ductile iron or cast iron body. Steel reinforced Buna-N rubber flapper epoxy coating on wetted parts. MSS SP-80.

D. Gruvlok Series 7800 Check Valve: Horizontal installation. Working pressure to 300 PSI, Type 304/302 Stainless Steel conforming to ASTM 167. Ductile body, ASTM A536, and stainless clapper, EPDM, nitrile or optional viton bumper and bonnet seals. Stainless wetted parts.

2.07 BACKFLOW PREVENTION ASSEMBLIES

A. General: Assemblies model numbers listed below are for general comparison. Project specific model numbers to be verified contractor as approved by jurisdiction where project is located.

B. Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications:

1. 2-inches and Smaller: Assembly consists of shutoff ball valves in inlet and outlet, and strainer on inlet. Assemblies include test cocks and pressure-differential relief valve located between two positive seating check valves and comply with requirements of ASSE Standard 1013 and AWWA C511. Bronze construction, threaded ends, stainless steel internal parts, FDA strainer, and air gap fitting. Route pipe from air gap fitting to approved waste receptor.

2. 2-1/2-inches and Larger: Assembly consists of shutoff OS&Y gate valves in inlet and outlet, and strainer on inlet. Assemblies include test cocks and pressure-differential relief valve located between two positive seating check valves and comply with requirements of ASSE Standard 1015 and AWWA C511. Epoxy coated cast iron body construction, flanged ends, stainless steel internal parts, bronze seats, and FDA strainer.

C. Double Check Valve Assembly (DCVA) for Low Hazard Applications:

1. 2-inches and Smaller: Assembly consists of shutoff ball valves in inlet and outlet, and FDS strainer on inlet. Assemblies include test cocks and two positive seating check valves and comply with requirements of ASSE Standard 1015 and AWWA C510. Bronze construction, threaded ends, and stainless steel internal parts.

2. 2-1/2-inches and Larger: Assembly consists of shutoff OS&Y gate valves in inlet and outlet, and strainer on inlet. Assemblies include test cocks and two positive seating check valves and comply with requirements of ASSE Standard 1015 and AWWA C510. Epoxy coat cast iron body construction, strainer flanged ends, and stainless steel internal parts.

D. Spill Resistant Pressure Vacuum Breaker: Watts Model 800MCQT with 777S "Y" strainer.

E. Atmospheric Vacuum Breaker: Assembly consists of a bronze vacuum breaker body with silicone disc, and full size orifice. Device to be IAPMO listed, meet ASSE standard 1001, and ANSI standard A113.1.1 rough chrome plate finish.

2.08 PRESSURE REGULATING VALVE-DOMESTIC WATER

A. Water: Bronze body, diaphragm or piston type, spring actuated, with separate or integral stainless steel strainer, pressure range to suit conditions, approved for potable water use, low lead. Provide shutoff valves, pressure relief valves, unions, drain valve and bypass.

B. Water: Automatic control pressure regulating valve, stainless steel seat, stem and spring, diaphragm actuated with brass body, hydraulic control pilots with effluent operating temperature range 32 degrees F to 180 degrees F, FDA and AWWA approved.

C. Water: Bronze body construction, stainless steel strainer screen, thermal expansion bypass with renewable stainless steel seat and high temperature resisting diaphragm.

2.09 THERMOSTATIC MASTER MIXING VALVES (ASSE 1017 RATED)

A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1017.

B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing

requirements.

C. Flow from the tempered water circulating pump to be split to mixing valve and building hot water heating system.

2.10 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED)

A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1070.

B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.

END OF SECTION

SECTION 26 05 00
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.01 DESCRIPTION

A. General Conditions:

1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this Section.

B. General Requirements:

1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.

2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.

3. Cooperate with other trades and Contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.

4. The OWNER shall be provided access to all software to include copies of software for all systems provided under this division of the specifications. Software shall be password protected where applicable.

5. Only qualified electrical Subcontractors will be allowed to submit proposals for this project. In order to be considered qualified, CONTRACTOR shall have completed a minimum of five (5) projects of similar type/scope and equal or greater magnitude and complexity within the last ten (10) years. Subcontractors without qualifications will be rejected. If desired, potential electrical Subcontractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid. Previous projects used to meet this experience requirement must have included similar (or greater) scopes of work for each of the following areas:

a. Power Systems.

b. Control Systems.

c. Instrumentation Systems.

C. Electrical Contractor Experience Requirements:

1. Electrical contracting firm shall be licensed as an Electrical Contractor in the state where work will be performed.

2. Only qualified electrical Subcontractors will be allowed to submit proposals for this project. In order to be considered qualified, Electrical Contractor shall have successfully completed, under his/her present firm name, not less than five (5) projects of similar size and scope within the last ten (10) years. For example, Electrical Contractors proposing on water/wastewater projects shall have completed the specified quantities/types of water/wastewater projects. Similarly, the Electrical Project Manager and Electrical Foreman to be assigned to this project must meet the following minimum requirements:

   a. Minimum of 5 years of experience (in their current/respective role) with projects of similar size and scope.

   b. The Electrical Project Manager and Electrical Foreman should be assigned to the project for its duration. Any changes made shall be done with two weeks minimum notice and include the following:

      1) Reason for change in personnel.

      2) Proposed Replacement with resume and work history on similar type projects meeting the requirements listed above.

      3) Must meet OWNER approval before being assigned to the project.

3. Previous projects used to meet the experience requirement above must have included similar (or greater) scopes of work for each of the following areas:

   a. Power Systems.

   b. Control Systems.

   c. Instrumentation Systems.

4. Subcontractors without qualifications will be rejected. If desired, potential electrical Subcontractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid.

1.02 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.

B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property,

either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the ENGINEER. CONTRACTOR shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the OWNER in the presence of the prime consultant prior to start of any electrical demolition.

C. Furnish and install complete power, telephone and other electrical services as shown on drawings and/or specified herein.

D. Pay all electrical utility company service charges (if any) in connection therewith, including permanent meter deposit. Meter deposits will be refunded to CONTRACTOR at time of OWNER's acceptance.

E. Furnish and install complete power distribution system as shown on drawings and/or specified herein.

F. Furnish and install a complete Power Generation and Automatic Transfer Switch System as shown on drawings and/or specified herein.

G. Furnish and install complete reduced voltage soft starters and associated devices for motors as shown on drawings and/or specified herein.

H. Furnish and install disconnect switches for motors as shown on drawings and/or specified herein.

I. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.

J. Install and connect electrical equipment mentioned in Division 26/27/28 Specifications or noted in drawings, whether furnished by Electrical Contractor or by others.

    1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.

    2. Where shown or specified, CONTRACTOR shall receive, unpack, check and assume custody of equipment furnished by Others. CONTRACTOR shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until OWNER acceptance of project.

K. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.

L. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.

M. Furnish and install complete controls, instrumentation & auxiliary systems as shown on drawings and/or specified herein.

N. Furnish and install a complete Surge Protection System as shown on drawings and/or specified herein.

O. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.

P. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.

Q. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.

R. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

PART 2 – PRODUCTS

2.01 APPROVED MATERIALS AND DEVICES

A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of ENGINEER before installation. All like items and associated equipment/systems shall be of one manufacturer.

B. To ensure proper coordination, it is intended that all electrical equipment and materials specified in Division 26/27/28 of these specifications and shown on the electrical drawings be furnished and installed by the Electrical Subcontractor. It will not be permissible for any of these items to be furnished directly by the General CONTRACTOR without the Electrical Contractor's coordination.

C. To ensure commonality of spare parts, it is required that the Electrical Contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:

1. SECTION 26 05 73 – Power Distribution System Electrical Studies

2. SECTION 26 28 16 – Safety Switches and Fuses

2.02 SUBMITTALS

A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the CONTRACTOR intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.

B. Submit to ENGINEER ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.

C. Submit to ENGINEER promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:

1. SECTION 26 05 73 – Power Distribution System Electrical Studies
2. SECTION 26 28 16 – Safety Switches And Fuses
3. SECTION 26 29 00 – Manufactured Control Panels
4. SECTION 26 29 16 – Reduced Voltage Soft Starters, 600VAC
5. SECTION 26 32 13 – Generator Sets
6. SECTION 26 36 23 – Automatic Transfer Switches
7. SECTION 26 43 00 – Surge Protective Devices
8. SECTION 26 50 00 – Lighting Materials and Methods
9. ALL POWER DISTRIBUTION EQUIPMENT (i.e. SWITCHBOARDS, PANELBOARDS, DRY TYPE TRANSFORMER, ETC.)
10. ALL ELECTRICAL AND TELECOMMUNICATION EQUIPMENT LAYOUTS
    a. Submittals shall include ¼" = 1'-0" CAD drawings (hand drawn sketches will not be accepted) of each electrical room, IT room, electrical equipment stand, generator area, or any other similar area with electrical equipment. Drawings shall indicate all panelboards, transformers, switchboards, generators, equipment racks, control panels, HVAC equipment, etc. that are located in each electrical/IT area. Layouts shall show that each piece of electrical equipment has the clearances, working space and dedicated equipment space required by applicable codes. No conduits to equipment within these areas shall be installed until submittals have been provided and returned without exception by the design team.
11. ALL CONTROL ITEMS & SYSTEMS

D. The CONTRACTOR shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to ENGINEER. The failure of the CONTRACTOR to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the ENGINEER. Review by the ENGINEER will be for general conformance with contract documents. The CONTRACTOR shall be fully responsible for correctness of all submitted dimensions,

details, quantities and locations.

E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by ENGINEER without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.

F. Any required resubmittal will be reviewed by the ENGINEER for conformance with previously issued comments only. The CONTRACTOR shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.

G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the ENGINEER. All material proposed for substitution is subject to the approval of the ENGINEER and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.

H. Samples of material shall be furnished where required by drawings or Division 26/27/28 Specification, or as requested by the ENGINEER on items proposed as substitutes.

I. Submit to ENGINEER a certificate of final inspection from local inspection department.

PART 3 – EXECUTION

3.01 SITE VISIT

A. The CONTRACTOR shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves CONTRACTOR of his responsibility under Contract.

3.02 CLEARANCE WITH UTILITIES

A. It shall be the responsibility of this CONTRACTOR, prior to bid, to reaffirm with the utility companies involved that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to OWNER after a contract is entered into.

B. On many projects the utility company may levy charges due to locations, size or type service involved. The CONTRACTOR shall be responsible for these charges (including permanent meter deposit), unless such charges are not available prior to bid and CONTRACTOR so documents as described below. The meter deposit will be refunded to the CONTRACTOR at time of OWNER's acceptance.

C. Should above cost not be available, prior to bid, CONTRACTOR must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be

submitted by Prime CONTRACTOR with his bid to OWNER. The cost will then be deleted from the Contract and become responsibility of the OWNER.

D. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

3.03 WORKMANSHIP

A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.

B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.

C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.

D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.

E. Keep site clean of accumulation of cartons, trash and debris.

3.04 SAFETY

A. The CONTRACTOR is solely responsible for all job safety. ENGINEER assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably ensure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

3.05 CONTRACT DOCUMENTS

A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.

B. Contract documents consist only of the hardcopy documents issued by the Prime ENGINEER. Electronic documents issued directly by the Electrical Engineer to the CONTRACTOR and/or its Subcontractors/vendors are issued for convenience only (electronic documents are not formal contract documents).

C. If the CONTRACTOR and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:

1. Sign a waiver prepared by the Electrical Engineer prior to the transmittal of these files.

2. Agree to pay the Electrical Engineer a fee of $50.00 per drawing, up to a maximum of $400 per transfer, payable upon receipt of the files.

3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.

D. Take finish dimensions at job in preference to scaled dimensions.

E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of ENGINEER.

3.06 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify ENGINEER immediately if any conflict is found.

3.07 EQUIPMENT STORAGE

A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. CONTRACTOR shall be responsible for replacing or repairing improperly-stored equipment as directed by ENGINEER.

3.08 EXCAVATION, CUTTING AND PATCHING

A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After ENGINEER's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of ENGINEER before cutting into any structural members.

B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

3.09 PENETRATIONS

A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 26/27/28 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet

metal section. Supply these flashings for installation under roofing and sheet metal section.

B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.

C. Where penetrations are required through structural elements, verify penetration locations and sizes with Structural Engineer. In no case shall the structural integrity be compromised without written approval from Structural Engineer.

3.10 INSTALLATION OF EQUIPMENT – GENERAL

A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.

B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment, devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.

C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted stainless steel disconnect switches shall be mounted to stainless steel unistrut frames.

D. All electrical equipment, furnished by CONTRACTOR or by others shall be covered and protected during construction.

E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.

F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

3.11 MOTORS, STARTERS AND CONTROLS

A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.

B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.

C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit by the electrician.

3.12 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.

B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by CONTRACTOR into larger, single homerun conduits unless specific permission is granted by the ENGINEER.

3.13 LUG/TERMINAL RATINGS

A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the CONTRACTOR.

B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

3.14 EQUIPMENT FAULT CURRENT RATINGS

A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

3.15 OUTLET LOCATION

A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the CONTRACTOR's responsibility to coordinate with other trades to ensure correct installation.

3.16 IDENTIFICATION

A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.

B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.

C. See Specification SECTION 26 05 53 for additional requirements.

3.17 GROUNDING

A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

3.18 PAINTING

A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

3.19 ACCEPTANCE TESTING

A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the ENGINEER. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.

B. The Electrical Subcontractor shall include in bid price start-up assistance and training from a certified representative of the manufacturer for the following systems:

1. SECTION 26 29 16 – Reduced Voltage Soft Starters, 600VAC

2. SECTION 26 32 13 – Generator Sets

3. SECTION 26 36 23 – Automatic Transfer Switches

3.20 OPERATION AND MAINTENANCE DATA

A. One set of marked "AS BUILT" drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to OWNER. These items shall be bound in hard back book. CONTRACTOR shall explain and demonstrate all systems to OWNER's representative.

3.21 GUARANTY-WARRANTY

A. Furnish a written Guaranty-Warranty, countersigned and guaranteed by General CONTRACTOR, stating:

1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.

2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION

SECTION 26 05 19
POWER CONDUCTORS AND CABLES 51V-600V

PART 1 – GENERAL

1.01 DESCRIPTION

A. Power Wires and Cables

B. Low Voltage Wires and Cables

PART 2 – PRODUCTS

2.01 POWER WIRES AND CABLES - 600 VOLT

A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.

B. General Application (see below for exceptions):

1. At or Below Grade (including within slab-on-grade):

a. #8 or larger conductors:

1) XHHW or RHH/RHW/USE stranded (in conduit).

b. #10 or smaller conductors for circuits terminating at motors:

1) THHN/THWN or XHHW stranded (in conduit).

c. #10 or smaller conductors (excluding circuits terminating at motors):

1) THHN/THWN or XHHW solid (in conduit).

2. Above Grade:

a. #8 or larger conductors:

1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).

b. #10 or smaller conductors for circuits terminating at motors:

1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).

c. #10 or smaller conductors (excluding circuits terminating at motors):

1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).

3. Power Wire and cable shall be as manufactured by Southwire, Rome, Encore Wire, American Insulated Wire, Okonite, Phelps-Dodge, Amercable, Aetna or approved equal.

C. VFD Cabling

1. Wiring/Cabling installed between each VFD (Variable Frequency Drive) and the associated motor shall be multi-conductor shielded VFD power cable with the following characteristics:

   a. Multi-conductor cable with three (3) power conductors and three (3) ground conductors

   b. Soft annealed flexible stranded copper conductors.

   c. 1kV cross-linked polyolefin insulation (to resist the potential reflected voltages experienced in 600VAC VFD applications).

   d. Metallic shielded providing 100% shield coverage

   e. Oil, abrasion, chemical & sunlight resistant thermosetting compound outer jacket.

   f. Flexible TC-ER rated, UL listed for use in cable trays.

   g. Equal to AmerCable #37-108VFD cable.

D. Class 1 Control Cabling (120VAC Control Circuits, Etc.)

1. Unless specified otherwise, Class 1 control cabling shall:

   a. Be rated for exposed cable tray installation.

   b. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).

   c. Be UL-rated for the proposed application.

   d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.

   e. Utilize copper conductors.

   f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.

g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.

h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

i. Be rated for 600V.

j. Be industrial grade.

k. Have stranded conductors.

l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.

2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

E. Fixture Wiring

1. Conductor Types:

a. Type TFFN or XFF.

2. Minimum Sizes:

a. For fixtures up to 300 watts: #16.

b. For fixtures over 300 watts up to 1500 watts: #14.

c. For fixtures over 1500 watts: as required.

d. Conductors to concrete pour fixtures: #12.

3. Fixture wire shall extend only from fixture to first junction, and not over 6 feet, except for concrete pour units.

2.02 WIRE CONNECTIONS:

A. All connector types:

1. Shall be properly rated for the proposed application by UL and per the manufacturer.

B. At Motor Connections (within motor terminal boxes):

1. On Unshielded Wire:

a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.

b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.

2. On Shielded Power Wire:

a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.

3. Cabling within motor terminal boxes shall be trained such as to prevent any splice/termination/connection kits from contacting inside edge(s) of the motor terminal boxes (to prevent chaffing of the insulation/splice/wiring which could lead to faults). Contractor shall carefully coordinate all required motor terminal box sizes to ensure proper capacity for all required conductors/splices.

C. Other Dry locations:

1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.

2. On Wire #10 and smaller: shall be made with one of the following:

a. Ideal Wing Nuts or equal by 3M .

b. Ideal Push-In Wire Connectors (for #12 and smaller only).

D. Other Wet/Damp locations:

1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by Ilsco, Burndy or T&B.

2. On Wire #10 and smaller: shall be made with one of the following:

a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

A. All wires and cables shall be installed in conduit unless specifically noted otherwise.

B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.

C. No splices shall be pulled into conduit.

D. No conductor shall be pulled until conduit is cleaned of all foreign matter.

E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.

F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.

G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

H. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

3.02 POWER WIRE AND CABLE INSTALLATION:

A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.

B. Multi-wire lighting branches shall be used as indicated.

C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).

D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).

E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.

F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

3.03 WIRE CONNECTIONS

A. See Part 2 above for material types.

B. Aluminum Wire Connections:

1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).

C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.

D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.

E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.

F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

3.04 SHIELDED CABLE INSTALLATION

A. Shielded VFD (power) cables:

1. The braided shields and internal grounding conductors of shielded VFD (power) cables shall be grounded at BOTH ends (at VFD and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.

2. Contractor shall coordinate the necessary size of conduit with the outer diameter of the proposed cable type to verify that the raceway loading does not exceed NEC requirements prior to rough-in of the conduit system.

B. Shielded instrumentation (low voltage) cables:

1. The outer foil of shielded instrumentation cables shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

3.05 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:

1. Cabling shall be plenum-rated, multi-conductor.

2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.

3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.

4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.06 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.07 LABELING AND COLOR CODING OF WIRE AND CABLE

A. Refer to Specification Section 26 05 53 for all labeling requirements.

B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI-LEG)	ORANGE
C	BLUE	BLUE	YELLOW
NEUTRAL	WHITE	WHITE	GRAY
GROUND	GREEN	GREEN	GREEN

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C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240 COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

D. Control Conductors: Shall be color coded by use of colored "tracers". No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

3.08 TESTING

A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 1000-volt DC Megger Tester prior to energization or final termination. Any feeder conductor with an insulation resistance less than the recommended minimums in the latest version of NETA Acceptance Testing Specification ("ATS") standard shall be replaced by the contractor at the contractor's expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION

SECTION 26 05 26
GROUNDING

PART 1 - GENERAL

1.01 GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:

1. Service Equipment.

2. Transformers.

3. Non-current carrying conductive surfaces of equipment.

4. Metal Buildings.

5. Structures.

6. Other Equipment.

1.02 GENERAL REQUIREMENTS

A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to ensure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.

B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall ensure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.

B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be "jumpered" by an appropriate bonding conductor.

C. Supplemental grounding system conductors shall be bare, softdrawn, stranded, single conductor copper wire, and generally sized as follows (unless shown otherwise on plans):

1. Switchgear, motor control centers, and power transformer #4/0 minimum or as shown on plans.

2. Power panels, #2/0.

3. Control panels and consoles, #4.

4. Process Motors, #1/0.

5. Building Columns, #4/0.

6. Light Poles, #2.

7. Telephone Backboard & Cabinet ground busses, #2.

2.02 GROUNDING ELECTRODES

A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, CONTRACTOR shall provide sectional rods, connectors, drive heads, etc.

2.03 CONNECTIONS

A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.

B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).

C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.

D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.

E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

2.04 MANUFACTURERS

A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.

B. Lugs shall be as manufactured by Square "D", Burndy, or T and B.

C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.

D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.

E. Split post grounding shall be as manufactured by Burndy or T and B.

PART 3 - EXECUTION

3.01 MAIN SERVICE GROUND

A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:

1. The main underground cold water pipe (metal).

2. The metal frame of the building.

3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.

B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

3.02 TRANSFORMER GROUNDS

A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

3.03 EXPOSED NON-CURRENT-CARRYING METAL PARTS

A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.

B. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8".

C. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground. Connections from the supplemental grounding system (when specified) shall be made directly to the motor frame. Additionally, utilization equipment connected to the motor (pump, fan, mixer, etc.) shall be bonded to the motor with flexible braid-type bonding strap to ensure equalization of ground potentials.

D. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible "jumpers" shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections or rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

E. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.

F. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the CONTRACTOR as directed by equipment suppliers.

G. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.

H. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

3.04 ACCEPTANCE DOCUMENTATION AND TESTING

A. CONTRACTOR shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by ENGINEER.

B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.

C. CONTRACTOR shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 ("Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System"). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the ENGINEER prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION

SECTION 26 05 33
RACEWAYS

PART 1 - GENERAL

1.01 DESCRIPTION

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Conduits
2. Conduit Fittings
3. Couplings & Connectors
4. Bushings
5. Raceway Hardware, Conduit Clamps & Supports
6. Watertight Entrance Seal Devices

PART 2 - PRODUCTS

2.01 CONDUITS

A. PVC-Coated Rigid Steel:

1. The PVC coated rigid metal conduit must be UL Listed. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
2. The PVC-coated rigid metal conduit shall be ETL PVC-001 listed.
3. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
4. Form 8 Condulets®, 3/4" through 2" diameters, shall have a tongue-in-groove "V-Seal" gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
5. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
6. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.

7. Form 8 Condulets® shall be supplied with plastic encapsulated stainless steel cover screws.

8. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.

9. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30deg.F (-1deg.C).

10. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.

11. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.

12. Independent certified test results shall be available to confirm coating adhesion per ETL PVC-001 standards under the following conditions:

    a. Conduit immersed in boiling water with a minimum mean time to adhesion failure of 200 hours. ASTM D870)

    b. Conduit and condulet exposure to 150deg F (65deg C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D11513.

    c. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).

    d. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).

    e. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1.

    f. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.

13. Water tight flex connectors used in areas where PVC coated metal conduit is utilized shall be PVC coated also.

14. Shall be as manufactured by Perma-Cote, Plastibond, Korkap, Ocal or Okote.

B. Rigid Galvanized Steel and I.M.C.:

1. Shall be galvanized outside and inside by hot dipping.

2. Shall be as manufactured by Republic, Wheatland, Pittsburg Standard, Youngstown, Allied or equal.

C. Rigid Aluminum:

1. Shall be manufactured of 6063 Alloy, T-1 temper.

2. Shall be manufactured by Republic (Nucor), Wheatland, Allied (Atkore), Penn or equal.

D. Schedule 40 and 80 PVC:

1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.

2. The conduit manufacturer shall have had a minimum of 5 years' experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.

E. HDPE Innerduct

1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.

2. Shall be corrugated unless noted otherwise.

3. Shall be manufactured by Carlon, Ipex or equal.

F. Liquidtight Flexible Metallic Conduit:

1. Shall be galvanized steel-core sealtite, code approved for grounding.

2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.

3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

1.02 FITTINGS, COUPLINGS & CONNECTORS

A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.

B. All fittings, conduit bodies, couplings and connectors **(including, but not limited to, condulettes, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.)** used in areas where PVC-Coated Rigid conduit is used shall also be PVC-coated.

C. All fittings, conduit bodies, couplings and connectors **(including, but not limited to, condulettes, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors,**

etc.) installed in other wet, exterior or process areas where PVC-coated conduit systems are not required, shall be aluminum or stainless steel type. Standard steel fittings will not be acceptable.

D. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.

E. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.

F. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.

G. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as manufactured by Efcor, Raco, Midwest or equal.

H. All LB unilets sizes 1 ¼" or larger shall have rollers.

I. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

1.03 BUSHINGS

A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney type "BB" or equal by T&B, Midwest Electric or Penn Union).

B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type "B" or equal by T&B, Midwest Electric or Penn Union.

C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type "BLG" or equal by T&B, Midwest Electric or Penn Union.

1.04 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

A. All hardware such as expansion shields, machine screws, toggle bolts, "U" or "J" bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).

B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

C. Supports in exterior, process, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.

E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

1.05 WATERTIGHT ENTRANCE SEAL DEVICES

A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).

B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Minimum Diameter: 3/4-inch.

B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:

1. Exterior, Exposed: Rigid Aluminum unless otherwise noted.

2. Exterior, Used for Instrumentation Circuits: See Below.

3. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See "transition" items below for additional requirements. Conduits shall be left exposed until after ENGINEER's observation.

4. Raceways used for Instrumentation Circuits:

a. Typical Dry or Wet Locations: Rigid Aluminum .

b. Underground or Locations Embedded inside Poured Concrete: PVC-Coated Rigid Steel.

c. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): PVC-Coated Rigid Steel.

5. Terminations at motors, transformers and other equipment which has moving or vibrating parts:

a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.

6. Terminations at instruments:

    a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 12 inches in length) with watertight fittings.

7. Transition from underground or concrete-encased to exposed:

    a. Convert PVC to PVC-Coated Rigid Steel utilizing PVC-Coated Rigid Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6" above floor level, and shall be installed at uniform heights.

3.02 RACEWAY INSTALLATION

A. General:

1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.

2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.

3. Where any run of rigid aluminum conduit (including bends) exceeds 50' in length, an approved conduit expansion fitting shall be installed (beginning at center of run) at intervals not to exceed 50' on center.

4. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.

5. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.

6. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.

7. All PVC joints shall be made as follows:

    a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.

    b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.

    c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.

8. All metallic conduit installed below grade or within concrete shall be coated with two

9. (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.

10. Install ground wire sized per N.E.C. Table 250.122 in all conduits.

11. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.

12. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings.

13. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) or urethane paint (for PVC-Coated Rigid Steel) as recommended by conduit manufacturer .

14. Installation of PVC coated conduit systems shall be performed in strict accordance with the manufacturer's installation instructions. Damage to PVC coated conduit coating shall be touched up with patching compound as directed by manufacturer. To assure correct installation, the installer shall be certified by the manufacturer to install coated conduit.

B. Routing/Locating:

1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.

2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.

3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.

4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.

5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3" from the covering of the pipe crossed.

6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.

7. No conduit for instrumentation shall be run closer than 12 inches to parallel power conduits.

8. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).

9. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.

2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).

3. All bends in raceways containing multi-conductor power cables (such as shielded VFD cables) shall be long radius bends (24" minimum bending radius – varies with conduit diameter).

4. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance

5. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:

1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to ENGINEER's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.

2. Rigid Aluminum Conduits shall be supported at intervals not to exceed 5' on center.

3. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.

4. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.

5. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.

6. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:

1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.

2. In wet, exterior or process areas, conduits shall NOT enter tops of enclosures. All conduits shall enter enclosures from bottom, left or right sides of the enclosure (utilizing rain-tight Meyers hubs as indicated above).

3. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.

4. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.

5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.

6. CONTRACTOR shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to installation of conduit systems. CONTRACTOR shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.

7. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.

8. Conduit ends shall be carefully plugged during construction.

9. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

F. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly. Refer to drawings and other specifications for additional requirements.

2. All penetrations shall be at right angles unless shown otherwise.

3. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the Structural Engineer.

4. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.

5. All raceways entering structures, or where water is otherwise capable of entering equipment/devices through the raceway system, shall be sealed (at the first box or outlet) with foam duct sealant to prevent the entrance of gases or liquids from one area to another or into equipment/devices.

    a. Where the elevation of the raceway penetration (into the structure) is no more than 15' below the other (higher) end of the same raceway, Polywater FST sealant (rated to hold back up to 22' of continuous water head pressure), or pre-approved equal, shall be used.

    b. Where the elevation of the raceway penetration (into the structure) is between 15' and 75' below the other (higher) end of the same raceway, Polywater PHRD Custom Mechanical Seals (rated to hold back up to 36psi or 83' of continuous water head pressure), or pre-approved equal, shall be used.

    c. Where the elevation of the raceway penetration (into the structure) is more than 75' below the other (higher) end of the same raceway, the CONTRACTOR shall propose a custom solution designed to hold back or to drain the possible water within the associated raceway. Submittals shall be provided to the ENGINEER for review/approval, including a summary of the anticipated elevations/PSIs, details of the proposed installation, cut-sheets of devices/materials, etc.

6. Additionally, where necessary to ensure that water does not enter equipment/devices through the raceway system (where raceways extend to equipment/devices from wet areas), junction boxes with drain assemblies in bottom shall be located at low point of raceway system near equipment/devices (to drain water out of raceway system before it enters equipment/devices). CONTRACTORs shall provide drains in raceway systems where so necessary to prevent water entry into equipment/devices. In special applications (such as to instruments, etc.,), where cabling rated for exposed application is provided, CONTRACTOR may propose short air gaps (approximately 6" or less) between the end of the conduit system and the equipment/device cable entry (to be made with cable gland connectors) to prevent water in conduit system from entering equipment/devices in lieu of drained junction boxes.

7. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:

a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.

b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.

8. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).

9. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18" of the termination.

G. Exterior Electrical Ductbanks:

1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in concrete-encased ductbanks as follows:

a. A minimum of 3" of concrete shall encase each side of all ductbanks.

b. A minimum of 1 ½" of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.

c. Top of concrete shall be a minimum of 30" below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12" below grade.

d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.

e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION

SECTION 26 05 34
OUTLET BOXES, JUNCTION BOXES, WIREWAYS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Outlet and Junction Boxes

B. Pull Boxes

C. Wireways

PART 2 – PRODUCTS

2.01 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.

B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.

C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

2.02 JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.

B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.

C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.

D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal. Boxes shall have hinged covers and screw-down clamps.

E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal. Wireways shall have hinged covers and screw-down clamps.

F. Pre-cast Polymer Concrete Below-Grade Hand Holes & Pull Boxes:

1. Enclosures, boxes and cover are required to be UL Listed and conform to all test provisions of ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for Tier 15 applications (15,000lb design load and 22,500lb test load) unless noted otherwise.

2. All covers shall have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level shall be embossed on the top surface.

3. Cover shall be bolt-down include factory-labeling to read "Electric", "Communications" or other as directed.

4. Hardware shall be stainless steel.

5. Shall be Quazite PG/LG Style or approved equal.

PART 3 - EXECUTION

3.01 APPLICATION

A. General

1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by CONTRACTOR per NEC requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")

1. Sheet metal boxes shall be used on concealed work in ceiling or walls.

2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed. Cast boxes shall be Cast Aluminum wherever installed in same locations as Rigid Aluminum conduit

3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.

4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.

5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.

6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.

7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

C. Junction & Pull Boxes (larger than 4-11/16")

1. For all below grade exterior use and elsewhere as shown:

a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).

b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).

2. All boxes installed exposed in exterior or wet areas shall be stainless steel (NEMA 4X).

3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).

4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.

5. Padmounted Pull Boxes shall be installed as shown on Plans or as required by project conditions. Transclosure-style Padmounted boxes shall be installed wherever required by the quantities and sizes of conductors. CONTRACTOR shall submit all Padmounted Pull
6. Box types prior to ordering for ENGINEER's review and comment.

7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

8. All others shall be oil tight JIC box not less than 16 gauge.

3.02 INSTALLATION

A. General

1. All boxes and wireways shall be securely anchored.

2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.

3. All boxes and wireways shall be readily accessible. CONTRACTOR shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical connections, etc. accessible where above gypsum board ceilings or in other similar locations.

4. All metallic boxes and wireways shall be properly grounded.

5. Refer to Specification SECTION 26 05 53 for identification requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")

1. Boxes shall be provided with approved 3/8" fixture studs were required.

2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.

3. There shall be no more knockouts opened in any sheet metal box than actually used.

4. Any unused opening in cast boxes shall be plugged.

5. Back to back boxes to be staggered at least 3 inches.

6. Under no circumstances shall through-the-wall boxes be used.

C. Junction & Pull Boxes (larger than 4-11/16")

1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.

2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.

3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.

4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

D. Wireways and/or wall-mounted equipment

1. Mount each wireway to channels of the same metal type as the wireway.

2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Wire and cable identification.

B. Pullbox & Junction Box Identification

C. Electrical distribution & utilization equipment identification.

D. Emergency and Standby Power receptacle identification.

E. Instrument and control device identification.

F. Raceway identification.

PART 2 - PRODUCTS

2.01 WIRE AND CABLE IDENTIFICATION

A. Intermediate Locations:

1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.

B. Circuit/Cable Termination Locations:

1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

2.02 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

B. Text used on labels on electrical distribution & utilization equipment shall be sufficiently sized to allow user to quickly/easily read labels while standing a normal/reasonable distance from the equipment. Text sizes shall be adjusted based on types of equipment (large switchgear would require larger labels than small toggle-type disconnect switches). If there is any question about what is reasonable, contractor may submit typical physical sample label(s) for each major application to the engineer for review/approval, at its discretion.

2.03 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. Instruments and control device labels shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment or the adjacent, visible mounting surface with silicone adhesive or stainless steel wire ties.

2.04 RACEWAY IDENTIFICATION

A. Raceway labels shall be white thermal transfer marker plates permanently affixed to the associated raceway with stainless steel wire ties, with two wire ties (one on either end of marker plate to provide a flush installation) where possible. Labels shall be Panduit #M300X series or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Engineer for review and comment prior to installation.

B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.

C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).

D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

3.02 WIRE AND CABLE IDENTIFICATION

A. General:

1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.

B. Intermediate Locations:

1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:

a. Wireways

b. Pullboxes/Junction boxes larger than 4-11/16"

c. Pullboxes/Junction boxes through 4-11/16" where wires and cables are not easily identifiable via the color coding and box labeling

d. Vaults & Manholes

e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).

f. Other similar intermediate locations.

2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:

a. From where the circuit originates (including panel designation and circuit number):

1) Ex: "FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)"

b. To where the circuit extends (using the common name of the equipment):

1) Ex: "TO: RTU-6 (ON ROOF)"

c. The purpose of the circuit:

1) Ex: "POWER"

d. The set number (If parallel power feeds are used).

1) Ex: "SET NO. 3 OF 4"

C. Circuit/Cable Termination Locations:

1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.

D. Refer to Specification SECTION 26 05 19 for all color-coding requirements of wires and cables.

3.03 PULLBOX & JUNCTION BOX IDENTIFICATION

A. Concealed pullboxes/junction boxes:

1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: "RP-1A Cir. 1, 2 & 3"). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.

B. Exposed pullboxes/junction boxes:

1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled "Power", "Telecommunications", "Fire Alarm" or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.

C. Where pullboxes/junction boxes are named on contract documents (Ex:"PULLBOX #3"), an engraved nameplate shall be installed on the front surface of the box to identify the name.

3.04 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. General:

1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.

B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:

1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:

a. Ex: First Line: "NAME: RP-A", Second Line: "120/208V-3Ø-4W", Third Line: "FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)"

2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.):

1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):

a. Ex: First Line: "RTU-6", Second Line: "FED FROM: PP-A CIR. 5"

2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: "WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH".

3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: "WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER".

D. Emergency Systems:

1. A sign shall be placed at the service entrance equipment (and at any remote shunt trip operators, or similar, for service equipment) indicating the type and location of on-site emergency power sources (such as generators, central battery systems, etc.) per NEC requirements.

2. All boxes and enclosures (including transfer switches, generators, power panels, junction boxes, pullboxes, etc.) dedicated for emergency circuits shall be permanently marked with white-on-red engraved nameplates so they will be readily identified as a component of an emergency circuit or system.

3. Where an Essential Electrical System (EES) is installed, all enclosures, raceways and equipment that are components of the EES shall be readily identified as such. Raceway shall be identified at intervals not exceeding 25 ft.

E. Services:

1. All Service Equipment:

   a. Engraved nameplates identifying maximum available fault current, including date the fault current calculation was performed, in accordance with NEC article 110.24.

      1) Ex: First Line: "AVAILABLE FAULT CURRENT: 16,154 AMPS", Second Line: "DATE CALCULATED: JULY 8, 2013"

   b. All service entrance equipment shall be clearly labeled as being service entrance rated.

2. Where a building or structure is supplied by more than one service (or any combination of branch circuits, feeders and services), a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders & branch circuits supplying that building or structure and the area served by each, per NEC requirements.

F. Generators:

1. Generators shall be labeled with engraved nameplates identifying name of equipment.

3.05 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. New Instruments and control devices (whether furnished by contractor or not) shall be labeled with black-on-white engraved nameplates permanently affixed to the equipment or to the adjacent, readily-visible mounting surface with silicone adhesive or stainless steel wire ties.

1. Instruments and process control devices (float switches, etc.) shall be labeled with instrument name and, where available, instrument ID number.

2. Pushbutton stations shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all pushbutton stations.

3. Thermostats and other similar HVAC control devices installed in process areas shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all thermostats and other similar HVAC control devices.

3.06 RACEWAY IDENTIFICATION

A. Each exposed raceway shall be labeled at the point where it becomes concealed, such as where it enters a concrete floor slab, a concrete wall, the ground, etc.

B. Each raceway entering in-grade or on-grade pullboxes/junction boxes, where the conduits are only visible inside the box, shall be labeled within the box at the point where the raceway becomes concealed.

C. Raceway nameplates shall identify:

1. The location of the other end of the raceway ("TO MCC-1" or similar). If the other end of the raceway is at an intermediate, named pullbox ("INSTRUMENTATION PULLBOX #4" or similar), that pullbox name shall be labeled rather than the endpoint of the circuitry.

3.07 OTHER IDENTIFICATION

A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION

SECTION 26 05 73
POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Power Distribution System Electrical Studies.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Short Circuit Studies, Protective Devices Evaluation Studies, Protective Device Coordination Studies and Arc Flash Hazard Studies shall be performed by the same entity, which shall be a Professional Engineer registered in the state where the equipment will be installed. The studies shall be per the requirements set forth in the latest edition of NFPA 70E-Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.

B. The studies shall be submitted to the ENGINEER prior to shipment of any electrical distribution equipment.

C. The studies shall include all portions of all electrical systems affected by the project (including any existing systems/equipment) from the utility service to any existing equipment at the facility (including all existing equipment fed from the same service point as any new equipment) and to all new equipment installed under this contract. All induction motors 50 HP or below and fed from the same bus may be grouped together. All induction motors greater than 50 HP shall be included individually with associated starters and feeder impedance. See individual study sections below for additional scope requirements.

D. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) or EasyPower software program.

E. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.

F. The CONTRACTOR shall be responsible for collecting data on any existing or proposed electrical equipment, devices, conductors, etc. as required to prepare the study, and shall supply pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the studies to be completed prior to shipment of equipment.

G. The Power Distribution System Electrical Studies shall be performed by Square 'D' or Cutler Hammer; or a third-party vendor if specifically approved by the ENGINEER prior

to preparation of the studies.

H. The proposed vendor shall have completed a minimum of five (5) equivalent Arc-Flash Hazard Studies in the past three (3) years.

2.02 SHORT CIRCUIT STUDY

A. The Short Circuit Study shall be performed with aid of a computer program. The study input data shall include the power company's short circuit contribution, resistance and reactive components of the branch impedances, X/R ratios, base quantities selected, and other source impedances.

B. Short circuit momentary duty values and interrupting duty shall be calculated on each individual basis with the assumption that there is a three-phase bolted short circuit at the respective switchgear bus, switchboard, low voltage motor control center, distribution panelboard, and other significant locations throughout the system.

C. The short circuit tabulation shall include symmetrical and asymmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contributions from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

2.03 PROTECTIVE DEVICE EVALUATION STUDY

A. The Protective Device Evaluation Study shall be performed to determine the adequacy of circuit breakers, switches, transfer switches, and fuses by tabulating and comparing the short circuit rating of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied.

B. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the ENGINEER's attention.

2.04 PROTECTIVE DEVICE COORDINATION STUDY

A. The Protective Device Coordination Study shall be performed to provide the necessary calculation and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.

B. The coordination study shall show the best coordination attainable for all breakers down through the largest breaker at each piece of distribution equipment. Coordination study shall demonstrate selective coordination where required by applicable codes or contract documents.

C. Phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices. Where ground fault protection is used, coordination of the

ground fault protection with the first downstream overcurrent phase protection device shall be demonstrated.

D. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves be maintained.

2.05 ARC-FLASH HAZARD STUDY

A. The Arc-Flash Hazard Study shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.

B. The Arc-Flash Hazard Study shall be performed in conjunction with a short-circuit Study and a time-current coordination Study.

C. The Arc-Flash Hazard Study shall be performed for the following equipment:

1. All Distribution Equipment – This includes but is not limited to the following:

a. Switchgear

b. Switchboards

c. Motor Control Center

d. All Lighting and Power Panelboards

e. Fused Disconnect Switches rated greater than 100A

2. Separately enclosed devices fed from protection device rated greater than100A - This includes but is not limited to the following:

a. Control Panels

b. VFD's

c. RVSS

D. A generic Arc-Flash label shall be applied to other electrical equipment that has not been included in the study. This includes but is not limited to the following equipment:

1. Non-fused Disconnect Switches

2. Fused Disconnect Switches rated 100A or less

3. Transformers

4. Control Panels, VFD's, RVSS, etc. rated 100A or less

E. Where a main protective device is provided, the study shall be performed on the line side and load side of the main. The worst-case result shall be used for the study result and label.

F. The Study shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

G. Where incident energies are calculated to fall within the high marginal region of a given Hazard/Risk Category Level, the Hazard/Risk Category Level shall be increased one level.

H. The Arc-Flash Hazard Study shall be performed in compliance with the latest IEEE Standard 1584, the IEEE Guide for Performing Arc-Flash Calculations. Where IEEE 1584 does not have a method for performing the required arc-flash calculations (such as for single phase equipment), calculations shall be performed and system shall be modeled using modules/methods as recommended by the arc flash software supplier (for example, using SKM Unbalanced/Single Phase Studies module for modeling single phase systems).

I. Equipment labels to identify AFIE and appropriate Hazard/Risk Category in compliance with NFPA 70E and ANSI Z535.4 (latest version of these requirements) shall be provided to the Electrical Contractor. The Electrical Contractor shall affix the labels to the distribution equipment devices as directed by the equipment manufacturer. These labels shall, at a minimum, include the following:

1. WARNING label.
2. Hazard/Risk Category.
3. Arc Flash Boundary Distance.
4. Incident Energy (in cal/cm2) at Working Distance.
5. Shock Hazard Voltage.
6. Limited Approach Boundary Distance.
7. Restricted Approach Boundary Distance.
8. Prohibited Approach Boundary Distance.
9. Equipment Name.
10. Name of Firm who prepared the Study.
11. Project Number of the Firm who prepared the Study.
12. Date that the Study was prepared.
13. Method for calculating analysis data.

14. Statement to read: "Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label" (or equivalent).

PART 3 - EXECUTION

3.01 SUBMITTAL REQUIREMENTS

A. The results of the studies shall be summarized in a final report. The report shall include the following sections:

1. General:

a. Description, purpose, basis and scope of the studies

b. Single line diagram of the portion of the power system which is included within the scope of the work. The single line diagram shall fit on one sheet of paper (size as required) unless approved otherwise by ENGINEER. The following information shall be shown on the single line diagram:

1) Device Name

2) Branch Fault Currents with directional indicators

3) General Location (for busses only)

4) Other basic component information such as cable type, cable length, breaker rating, buss short circuit rating, transformer voltages, transformer size, fuse size, etc..

2. Short Circuit Study:

a. Tabulation of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.

3. Protective Device Evaluation/Coordination Study:

a. Protective devices time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

b. Fault current calculations including definitions of terms and a guide for interpretation of computer printout.

c. Documentation from utility company on their letterhead showing their anticipated values of available short circuit currents X/R ratios and protective devices with which the power distribution system will coordinate.

d. Time-current characteristics of the respective protective devices shall be plotted on log-log paper. Plots shall be printed in color with a dedicated color and pattern for each curve for clear identification.

e. Plots shall include complete titles, respective single line diagrams and legends, and associated power company's relay or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breakers trip curves and fuses.

f. The coordination plots shall indicate the type of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents.

g. The coordination plots for phase and ground protective devices shall be provided on a system basis.

h. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.

4. Arc-Flash Hazard Study:

a. Tabulation of device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.

b. Recommendations for reducing AFIE levels and enhancing worker safety.

B. Furnish all labor, materials, calculations, electrical equipment, technical data and incidentals required to provide a complete short circuit study, coordination study and arc flash hazard study of protective devices, busses, etc. from the utility service to any existing equipment at the facility and all new equipment installed under this contract.

C. The study shall comply with the following applicable provisions and recommendations of the latest revisions of the following: ANSI C37.5, IEEE Standard No. 399, and IEEE Standard No. 141.

D. Submit calculations and results of the short circuit, protective device evaluation and coordination and arc flash hazard studies prior to submitting shop drawings for new equipment. CONTRACTOR shall verify that all proposed equipment is properly rated per the short circuit and protective device evaluation portions of the study prior to releasing equipment for manufacturing.

E. Submit a copy of a sample typical arc flash label layout (meeting requirements outlined above) that will be used for the project.

F. Submit final electronic copies of all SKM program files/models/input data/etc. used to perform the study to the OWNER with final close-out documents. These files shall be complete as required to allow future users to recreate the study.

3.02 INSTALLATION

A. CONTRACTOR shall adjust all breaker settings as recommended by the coordination study prior to energizing equipment.

B. CONTRACTOR shall affix arc flash hazard notification labels (as determined by the results of this study) to each piece of distribution equipment prior to energization of equipment. A generic arc-flash warning label shall be affixed to any electrical equipment not included in the analysis as outlined above.

C. Where short circuit rating of equipment is dependent on setting of upstream overcurrent device, provide and install label for equipment indicating the required settings of the associated device.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Wiring Devices

B. Plates

C. Finishes

PART 2 – PRODUCTS

2.01 WIRING DEVICES AND PLATES

A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

B. Receptacles shall have blade configuration and shall be heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.

D. Each wiring device shall have a plate (see "Finishes" section below for specific requirements).

2.02 FINISHES

A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.

B. Coverplates for recessed, wall-mounted electrical items (switches, receptacles, telephone outlets, etc.) shall be stainless steel unless shown otherwise.

C. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets, underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.

D. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.

E. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.

F. See "Electrical Identification" specification section for coverplate labeling requirements.

PART 3 – EXECUTION

3.01 GENERAL MOUNTING

A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the CONTRACTOR's responsibility to coordinate with all trades to secure correct installation. For example, CONTRACTOR shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.

B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.

C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.

D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.

E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.

1. Receptacles and telephone outlets in offices and other finished areas: 1'-6" to the center of the box.

2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4'-0" to the center of the box.

3. Receptacles over counters: As Noted

4. Switches, general: 4'-0" to the top of the box.

5. Push-button, etc., general: 4'-0" to the top of the box.

6. Other device types: verify with ENGINEER prior to rough-in.

END OF SECTION

SECTION 26 28 16
SAFETY SWITCHES AND FUSES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Safety Switches

B. Fuses

C. Branch Feeders

D. Feeders

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES

A. Safety switches shall be quick-make, quick-break, NEMA heavy duty type HD, fused or nonfused as shown. Switch blades shall be fully visible in the off position.

B. Safety switches shall be furnished with transparent internal barrier kits to prevent accidental contact with live parts. Barriers shall provide finger-safe protection when the switch door is open and shall allow use of test probes and removal of fuses without removing barrier.

C. Fused switches shall have provisions for class R, rejection type fuses.

2.02 FUSES (600V)

A. Fuses for all branch switches shall be Bussman Mfg. Co., Dual Element, Class "R" Fusetron.

B. Fuses for main switch/switches shall be Bussman Mfg. Co. Hi-Cap.

2.03 MANUFACTURER

A. Safety switches shall be as manufactured by Square 'D' or Cutler Hammer.

B. Fuses shall be as manufactured by Bussman Mfg. Co. or equal.

PART 3 - EXECUTION

3.01 SAFETY SWITCHES

A. Safety switches shall be installed as shown on the plans and in accordance with N.E.C.

B. Locations shown for safety switches on plans are diagrammatical only. Exact locations shall be field coordinated by CONTRACTOR as required to provide code-required clearances.

C. Switch enclosures shall be rated NEMA I indoors in dry locations and NEMA 4X stainless steel outdoors and in wet or process areas.

D. Adequate support shall be provided for mounting safety switches. Safety switches shall not be mounted to the associated equipment (unless the safety switch is furnished with the equipment).

3.02 FUSES

A. Fuses shall be sized as shown on drawings, unless a smaller size is required by the associated equipment supplier, in which case the CONTRACTOR shall provide fuses sized as directed by the associated equipment supplier at no additional cost.

B. Provide not less than one spare set of fuses for each size used. Provide an additional spare set for each five sets of same size fuses used.

END OF SECTION

SECTION 26 29 00
MANUFACTURED CONTROL PANELS

PART 1 - GENERAL

1.01 SCOPE

A. This section describes control stations, PLC panels, motor control panels, manufactured control panels, and other similar panels specified herein. Specifications herein are intended as an extension of requirements in other Divisions of these specifications where reference is made to Electrical Specifications.

1.02 DEFINITIONS

A. "Control Stations": Enclosures (with all required accessories) containing only door-mounted pushbuttons, indicator lights and/or selector switches (no electronic components or starter/controller equipment).

B. "Control Panels": Enclosures (with all required accessories) containing equipment/devices other than door-mounted pushbuttons, indicator lights and/or selector switches (such as electronic components, starter/controller equipment, etc.).

1.03 SUBMITTALS

A. Provide the following for each control panel:

1. A job-specific, custom wiring diagram

a. The wiring diagram shall clearly show all components (whether the components are mounted internal or external to the control panel enclosure).

b. All wires and terminal blocks shall be clearly labeled.

c. Diagram shall be in accordance with NEMA/ICS standards.

2. Size, type and rating of all system components.

3. Unit frontal elevation and dimension drawings.

4. Internal component layout diagrams.

5. Manufacturer's product data sheets for all components.

B. A Bill of Materials shall be included with catalog information on all components.

C. Information shall be included on any proprietary logic component sufficient to demonstrate its ability to perform the required functions.

D. The following calculations shall be submitted:

1. Thermal calculations showing amount of panel cooling/ventilating/heating required for each control panel, per ambient requirements listed below and operating temperature limitations of all equipment/devices within each control panel. See Part 2 below for requirements for forced air ventilation rather than air conditioning. Panel shall be oversized, interior equipment/devices shall be derated, and solar shielding shall be provided, etc, as required to allow the use of forced air ventilation as the cooling method. Air conditioning, ventilation, and/or heating equipment shall each have ratings/capacities at least 20% larger than required by calculations below unless noted otherwise:

    a. Thermal calculations used for sizing cooling/ventilation systems for each control panel located in exterior or non-conditioned spaces shall assume:

        1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.

        2) Full solar contact where applicable (not applicable where enclosures are fully protected from solar contact using solar shields separated from panel enclosure with standoffs or similar).

        3) No wind.

        4) Heat loss from interior equipment (electronics, etc.) per equipment supplier's information.

    b. Thermal calculations used for sizing heating systems for each control panel shall assume:

        1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.

        2) No heat loss by interior components of control panel.

        3) No solar gain on exterior of control panel.

        4) Doubling of heating wattage required to account for wind where control panels are located outdoors.

        5) Minimum temperature difference (due to heating) of 10 degrees F to prevent condensation, regardless of equipment temperature limitations.

2. Load calculations showing the sizing of all power supplies provided (with spare capacity as specified). Power supplies shall each have ratings/capacities at least 20% larger than required by load calculations unless noted otherwise.

3. Load calculations showing the sizing and anticipated runtime of all Uninterruptible Power Supply systems provided (with spare capacity as specified).

PART 2 - PRODUCTS

2.01 GENERAL

A. Control panels shall be Underwriters' Laboratories labeled by the panel manufacturer. Control panel manufacturers not capable of applying the U.L. label to their products are unacceptable.

B. All human interface equipment/devices (indicator lights, selector switches, pushbuttons, time switches, displays, keypads, and other similar items used for control, adjustments or monitoring) shall be mounted on the non-energized side of enclosure door(s) in such a way as to be accessible without exposing the user to energized parts.

2.02 RATINGS

A. All Control Panels shall have short circuit current ratings at least equal to the lesser of the following, unless noted otherwise on plans:

1. The short circuit current rating of the electrical distribution equipment that feeds the Control Panel.

2. 150% of the available fault current at the Control Panel as determined by a Short Circuit Current study prepared by a licensed professional Electrical Engineer.

B. All equipment/devices installed within control panels shall be rated to operate in ambient temperatures of 50 degrees C (122 degrees F) or higher.

2.03 ENCLOSURES

A. All enclosures (with any required accessories or auxiliary items) shall fit within the space shown on the Plans. Any costs associated with furnishing equipment which exceeds the available space shall be borne by the CONTRACTOR.

B. Enclosures (with any required accessories or auxiliary items) shall be suitable for the environment where installed.

C. Enclosure materials shall be as follows unless noted otherwise:

1. Control Stations:

a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).

b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).

c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 of die cast zinc/aluminum construction.

2. Control Panels:

a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).

b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).

c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 or 12.

D. Control Panel Enclosure Construction:

1. Non-metallic control panel enclosure material, where specified, shall be reinforced polyester resin or equivalent, with a minimum thickness of 3/16 inch for all surfaces except those requiring reinforcement. Panels shall be precision molded to form a one piece unit with all corners rounded. Exterior surfaces shall be gel-coated to provide a corrosion-resistant maintenance-free satin finish which shall never need painting. Color pigments shall be molded into the resin. Color shall be grey.

2. Metallic control panel enclosures, where specified, shall be fabricated using a minimum of 14 gauge steel for wall or frame mounted enclosures and a minimum of 12 gauge for freestanding enclosures. Continuously weld all exterior seams and grind smooth. Reinforce sheet steel with steel angles where necessary support equipment and ensure rigidity and preclude resonant vibrations.

3. Use pan-type construction for doors.

4. Door widths shall not exceed 36-inches.

5. Mount doors with full length, heavy duty piano hinge with hinge pins.

6. Provide gasket completely around each door opening.

7. Mount and secure all internal components to removable back plate assembly.

8. For NEMA 1 or 12 enclosures, provide handle-operated key-lockable three point stainless steel latching system for each door.

9. For NEMA 4X enclosures, provide provisions for padlocking all doors and provide clamps on three (3) sides of each door.

E. Control panel enclosures (and associated backpanels and other similar accessories) shall be manufactured by Hoffman Engineering Co., or Saginaw Control & Engineering.

2.04 CONTROL PANEL ACCESSORIES:

A. Panel ventilation systems shall be provided if so required by the application to maintain temperatures within the acceptable ranges of the interior equipment. In no case (regardless of temperature ratings of internal equipment) shall maximum temperatures within control

panels be allowed to exceed 50 degrees C (122 degrees F). Panel Air Conditioners or Heat Exchangers (to satisfy the specified thermal calculation requirements) are generally NOT acceptable unless specifically stated otherwise in these specifications, and shall not be provided for panels without specific written direction from the ENGINEER PRIOR to submission of panel shop drawings. Panels shall be oversized, provided with standoffs/shields, and/or ventilated as required to meet the contract requirements. Thermostats shall be provided to control cooling without need of manual operation. Thermostat setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Cooling units shall be as manufactured by Hoffman Engineering Co., Rittal or approved equal and shall be thermostatically controlled.

B. Space heaters shall be provided for condensation and temperature control. Thermostats AND hygrostats (or combination hygrotherm controllers) shall be provided to control heating requirements (based on temperature and relative humidity within enclosure) without need of manual operation. Setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Space heaters and associated control devices shall be as manufactured by Hoffman Engineering Co., Rittal, Stego or approved equal.

C. NEMA 4X control panels shall be provided with vapor-phase corrosion inhibitor(s) (chemical combinations that vaporize and condense on all surfaces in the enclosed area, to protect metal surfaces/devices within the enclosed area from corrosion). Corrosion inhibitor shall be Hoffman #AHCI series (sized as required by the enclosure volume to be protected) or equal.

D. For outdoor panels, stainless steel solar shields for front, top and each side of panel, supported to associated panel face with standoffs as required (to allow free air flow between solar shield and panel enclosure), shall be provided where required to limit solar loading on panel to allow use of a ventilated panel design rather than an air-conditioned panel design.

E. Provide a sun shield over all LCD displays in exterior-mounted panels. Sun shield shall be collapsible to fully protect LCD display from UV light when not in use, shall provide side and top shielding when in use, shall be constructed of stainless steel and shall be installed such as to maintain NEMA 4X ratings of enclosures.

F. Provide a clear polycarbonate gasketted hinged door or window to encompass all indicators, controllers, recorders, etc. mounted on NEMA 4 and 4X enclosures.

G. Provide interior mounting panels and shelves constructed of minimum 12 gauge steel with white enamel finish. Provide metal print pocket with white enamel finish on inside of door.

H. Provide interior LED light kit, mounted at top of interior of panel, and switched to turn "ON" when door is opened for the following control panels:

1. Control panels with outer dimensions greater than 20" wide or 30" high.

2. Control panels containing PLCs or other similar programmable devices.

I. Control panels containing VFDs or Reduced Voltage Soft Starters shall include a door mounted digital keypad for adjusting the starter parameters and viewing process values and viewing the motor and starter statuses without opening the enclosure deadfront door.

2.05 CONTROL COMPONENTS

A. General:

1. All pushbuttons, pilot lights, selector switches and other control devices shall be separate, standard size (full 30mm) and shape, heavy duty oil-tight units.

   a. Devices in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.) shall be of non-metallic construction.

   b. Devices in other areas shall be of chrome-plated construction.

2. All components and devices so that connection can be easily made and so there is ample room for servicing each item.

3. Door-mounted indicators, recorders, totalizers and controllers shall be located between 48" and 72" above finished floor level.

4. Door-mounted indicator lights, selector switches and pushbuttons shall be located between 36" and 80" above finished floor level.

5. All devices and components shall be adequately supported to prevent movement. Mounting strips shall be used to mount relays, timers and other devices suitable for this type of mounting.

B. Pilot Lights:

1. All pilot lights to be cluster LED type & push to test.

C. Pushbuttons:

1. All STOP operators within control stations located at equipment shall be provided with padlockable lockout provisions and a minimum of two (2) sets of contact blocks.

2. Emergency shutoff pushbutton devices shall be as follows unless noted otherwise:

   a. 44mm diameter, mushroom-style, maintained contact push buttons

   b. With a minimum of one (1) normally open dry contact and three normally closed dry contacts.

   c. Connections made such that pushing "in" the button will shutoff the associated equipment.

d. Provided with a red engraved nameplate with ½" lettering to read "Emergency Shutoff".

e. Provided with padlockable lockout provisions

D. Relays:

1. Control relays shall have the following characteristics, unless noted otherwise:

a. General purpose, plug-in type.

b. Minimum mechanical life of 10 million operations.

c. Coil voltage as indicated or required by application.

d. Single-break contacts rated 12 amperes, resistive at 240 volts.

e. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each individual relay shall have 3PDT contacts. Where required, multiple control relays shall be provided (to provide the required quantities of contacts) for each "relay" function shown on plans/diagrams.

f. Furnished with RC transient suppressor to suppress coil-generated transients to 200% of peak voltage.

g. LED on/off indicator light and manual operator.

h. Industry standard wiring and pin terminal arrangements.

i. Equal to Square D 8501KP series with matching plug-in socket.

2. Interposing/isolation relays used to isolate discrete output field wiring (and where required for voltage translation for other discrete signals) to/from PLC inputs/outputs shall be terminal-block style. Terminal-block style relays shall have the following characteristics, unless noted otherwise:

a. Minimum mechanical life of 10 million operations.

b. Single-break contacts rated 6 amperes, resistive at 120 volts.

c. One (1) N.O. contact per relay.

d. Furnished with integral transient protection.

e. LED on/off indicator light.

f. DIN-rail mounted.

g. Equal to Square D type Zelio RSL.

3. Timer relays shall be electronic, adjustable plug-in devices meeting the following characteristics, unless noted otherwise:

   a. General purpose, plug-in type.

   b. Minimum mechanical life of 10 million operations.

   c. Single-break contacts rated 10 amperes, resistive at 240 volts.

   d. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each relay shall have DPDT contacts (2 N.O. & 2N.C.). Where required, multiple timer or control relays shall be provided (to provide the required quantities of contacts) for each "relay" function shown on plans/diagrams.

   e. Rotary-thumbwheel adjustments for time value, timing range and function.

   f. Time value adjustments from .05 seconds to 999 hours

   g. Selectable Timing Functions, including the following:

      1) On Delay

      2) Interval

      3) Off Delay

      4) One Shot

      5) Repeat Cycle-Off

      6) Repeat Cycle-On

      7) On/Off Delay

      8) One Shot Falling Edge

      9) Watchdog

      10) Trigger On Delay

   h. Accuracy shall be + 2% and repeatability shall be + 0.1%.

   i. Furnished with integral transient protection.

   j. LED indicator light(s) for "timing" and "on/off status"

k. Held in place with hold-down spring

l. Equal to Square D type JCK with matching plug-in socket.

2.06 DC POWER SUPPLIES

A. DC Power supplies shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, AC-to-DC switching, output voltage as required, 120vac input, size as required for the initial application plus 50% spare capacity.

B. Redundant power supplies with diode isolation shall be provided so that the loss of one power supply does not affect system operation. The back-up supply systems shall be designed so that either the primary or the back-up supply can be removed, repaired, and returned to service without disrupting the system operation.

C. Power supply output shall be protected by secondary overcurrent protection device(s).

D. The power distribution from multiloop supplies shall be selectively fused so that a fault in one instrument loop will be isolated from the other loops being fed from the same supply.

E. Each power supply shall meet the following requirements.

1. Regulation, line: 0.4% for input from 105 to 132vac.

2. Regulation, load: 0.8%

3. Ripple/Noise: 15mV RMS / 200 mV peak to peak

4. Operating temperature range: 0 deg C - 60 deg C

5. Overvoltage protection

6. Overload Protection

7. Output shall remain within regulation limits for a least 16ms after loss of AC power at full load.

8. Output status indicator.

9. UL listing

F. Power supplies shall be manufactured by Puls, Sola, Phoenix Contact or equal.

2.07 UNINTERRUPTIBLE POWER SUPPLIES

A. Uninterruptible power supplies (UPSs) shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, size as required for the initial application plus 50% spare capacity unless noted otherwise.

B. Battery runtime shall be as specified elsewhere. If no other specification for battery runtime is specified, battery runtime shall be 12.5 minutes at full load.

C. UPSs shall be double-conversion, on-line type.

D. UPSs shall be rated for operation in -20 degrees C to 55 degrees C ambient temperatures.

E. UPS batteries shall be hot-swappable and 12-year rated when installed in 25 degrees C environment and 4-year rated when installed in 50 degrees C environment.

F. UPSs shall include dry contacts for the following alarm points:

1. Loss of Input Power Alarm

2. Low Battery Alarm

G. UPSs shall be manufactured by Falcon UPS or approved equal.

2.08 DISCONNECTS

A. A main disconnect switch or circuit breaker shall be supplied integral to all control panels. The main disconnect or circuit breaker shall be accessible/operable without exposing the operator to energized sections of the control panel(s), and shall be lockable in the open/off position.

B. Individual circuit breakers shall be provided integral to the manufactured control panel for each separate power circuit originating within the control panel.

C. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated (or can be adjusted to is 1200A or higher, breakers shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.

D. Manufacturers:

1. Square 'D' or Cutler Hammer.

2.09 COMBINATION STARTERS

A. All combination starters shall utilize a unit disconnect. Magnetic starters shall be furnished in all combination starter units unless specifically shown otherwise. All starters shall utilize full NEMA/EEMAC rated contactors (size 1 minimum).

B. Starters shall be provided with a three-pole, external (door mounted) manual reset, solid state overload relay. Solid state overload relay shall have switch-selectable trip class and shall provide protection from:

1. Overload.

2. Phase Unbalance.

3. Phase Loss.

4. Ground Fault (Class II detection).

C. Unless specifically shown otherwise, each combination starter or each group of starters shall be furnished with a control circuit transformer including two primary protection fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads (including motor space heaters and other similar loads where specified). The transformer rating shall be fully visible from the front when the unit door is opened. Unless otherwise indicated, control voltage shall be 120V AC. Control power shall be provided by individual unit control power transformers.

D. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.

E. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.

F. NEMA/EEMAC Size 1-4 starters shall be mounted directly adjacent to the wireway sothat power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.

G. Each starter shall be equipped with a minimum of the following control devices:

1. Door-mounted reset button.

2. Two (2) field-reversible (N.O./N.C.) auxiliary contacts

3. For reversing and two-speed starters: Four (4) field-reversible (N.O./N.C.) auxiliary contacts

4. Additional control devices as indicated on plans.

H. Control Wiring Terminal Blocks

1. Terminal blocks shall generally be:

a. Feed-thru, screw-in type

b. DIN rail mounted

c. Furnished with the stationary portion of the block secured to the unit bottom plate

d. Furnished with unit-mounted control terminal blocks for each field wire.

e. Rated for the voltage and current of the proposed application per UL/NEC standards.

f. Sized (by supplier) for the associated wire gauges/types/quantities.

g. Phoenix Contact UT-4 series, Weidmuller WDU-4 series (or equivalent) unless required otherwise by application.

I. Nameplates

1. Each unit shall be properly labeled with an engraved phenolic nameplate with a white background and black letters.

2. Each pilot device shall be properly labeled with a legend plate or an engraved phenolic nameplate.

J. Manufacturers:

1. Square 'D' or Cutler Hammer.

2.10 PLC'S AND NETWORK EQUIPMENT

A. Programmable Logic Controllers (PLCs):

1. Where PLCs are required by application or by other specifications/plans, where specific PLC makes/models are not otherwise called for (in other specifications), provide Rockwell CompactLogix 5370 series 1769-L33ER/ERM processors, 2MB of user memory, 8GB secure digital memory card, (2) integral 10Mbps/100Mbps/1Gbps Ethernet ports, (1) USB client, and chassis and other accessories as required.

B. I/O and Network Modules:

1. Provide I/O modules on associated controller backplane and network/communication modules as required by application and/or by interconnections indicated on contract documents.

2. Discrete inputs & outputs to/from motor starters (or other panels with 120VAC controls/CPTs) shall generally be rated for 120VAC unless noted or required otherwise (to coordinate with typical 120VAC CPTs at motor starters). Discrete inputs & outputs to/from equipment only rated for 24V discrete signals shall be rated for 24V. PLC panel supplier shall coordinate all I/O voltage rating requirements with associated remote panels/starters/equipment/devices prior to submitting panel shop drawings. Provide isolation relaying/etc. as required to use same voltage classes for discrete inputs and outputs to each piece of equipment (such as to allow a common conduit/raceway system to be used).

C. Ethernet Switches:

1. Where Ethernet switch(es) are required by application or by other specifications/plans,

provide Industrial Ethernet Switch(es), with copper ports for all required copper Ethernet connections plus 50% spares and fiber optic ports for all required fiber optic connections. Ethernet switches shall be Rockwell Stratix series or equal by Moxa or NTron.

D. Fiber Optic Patch Panels:

1. Where panel includes fiber optic network connections to external panels/equipment/devices, provide compact, din-rail mounted fiber optic patch panel(s) within panel as required. See Structured Cabling or other specifications for required fiber optic cable and connector types. Fiber optic patch panel shall be DINSpace Snap XL Compact type or equivalent, unless required otherwise by application.

2.11 WIRING

A. Refer to SECTION 26 05 19 for all wiring types/applications.

B. All wiring shall be identified on each end with hot stamped, shrink tube type, or self-laminating vinyl permanent wire markers to correspond with numbering shown on wiring diagrams.

C. All connections shall be made on terminals with no splices.

D. All wiring runs shall be along horizontal or vertical routes to present a neat appearance. Angled runs will not be acceptable. Group or bundle parallel runs of wire in plastic wire duct where practical.

E. All wiring runs shall be securely fastened to the panel or wire duct by means of plastic wire ties. Adequately support and restrain all wire runs to prevent sagging or movement.

F. AC power wiring and instrumentation/analog wiring shall be run separate.

G. Color code all internal wiring (not field wiring) as follows:

1. Line and load circuits: Black (B)

2. AC control wiring: Red (R)

3. Externally-Powered control wiring: Yellow (Y)

4. Neutral wiring: White (W)

5. Low voltage DC(+)pos: Blue (BL)

6. Low voltage DC(-)neg: Blue/White Tracer (BL/W)

7. Grounding: Green (G)

H. Terminal strips shall be provided for all input and output wiring. No more than two (2) wires shall be connected to one (1) terminal block.

2.12 ELECTRICAL SURGE AND TRANSIENT PROTECTION

A. General

1. Function: Protect the system against damage due to electrical surges.

B. Application: As a minimum, provide surge and transient protection (with proper grounding) at the following locations as described below:

1. Power Input High Frequency Noise Filtering:

a. 120VAC Control panels with integral UPSs, PLCs, or other electronic/microprocessor equipment that is susceptible to failure or improper operation due to high frequency/harmonic input transients shall be provided with series-connected high-frequency noise filters on the line input (downstream of any panel main disconnects/breakers). Filters shall be as manufactured by Edco/Emerson/Islatrol or equal (exact type(s) as required by application).

2. Power Input Surge Protection:

a. Provide surge protection device at any connection of 120VAC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:

1) Be mounted internal to the associated panel, with dedicated overcurrent protection.

2) Be of two-part (base and SPD), DIN-rail mountable construction.

3) Have 15kA total nominal discharge current per line (based on 8/20μs waveform).

4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.

5) Visually indicate operational status.

6) Be Dehn DEHNguard series or equal by MTL Technologies or Phoenix Contact, or may be combined with the High Freqency Noise Filtering device required above.

a. Provide surge protection device at any connection of multi-pole AC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:

1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
2) Provide protection for all phases.

3) Have 40kA (per phase) peak surge current rating.

4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.

5) Visually indicate operational status.

6) Be Square D SDSA or HWA series or equal.

3. Analog I/O Panel Terminations Surge Protection:

   a. Provide surge protection device at the PLC (or similar) panel connection of each analog I/O signal. Device shall:

      1) Be mounted internal to the associated panel.

      2) Be of two-part (base and SPD), DIN-rail mountable construction.

      3) Have the following nominal discharge current ratings:

         a) D1 Lightning impulse current (10/350 μs) per line: 1 kA

         b) C2 Total nominal discharge current (8/20 μs): 20 kA

         c) C2 Nominal discharge current (8/20 μs) per line: 10 kA

      4) Have maximum continuous operating voltage (MCOV) rating as required by the associated signal.

      5) Manufacturer and Model:

         a) DEHN BSP M4 BE 24 (926 324) with 920300 base.

         b) Phoenix Contact 2801263 with included base.

         c) Weidmuller 1093400000 with 8951710000 base.

4. Discrete I/O Panel Terminations Surge Protection:

   a. Provide isolation relay at the PLC (or similar) panel connection of each discrete output signal (within the associated panel). See above for isolation relay requirements.

5. Low Voltage Power Supply Load Side Surge Protection:

a. Provide surge protection device at the PLC (or similar) panel on the load side of each low voltage power supply that has low voltage connections extending external to the panel. Device shall:

1) Be mounted internal to the associated panel.

2) Be of two-part (base and SPD), DIN-rail mountable construction.

3) Have 10kA total nominal discharge current per line (based on 8/20μs waveform).

4) Have maximum continuous operating voltage (MCOV) rating as required by the associated utilization voltage.

5) Be as manufactured by Dehn, MTL Technologies, or Phoenix Contact.

6. Network Panel Terminations Surge Protection:

a. Provide surge protection device at the PLC (or similar) panel connection of each network cable. Device shall:

1) Be mounted internal to the associated panel.

2) Be of DIN-rail mountable construction.

3) Have 1kA total nominal discharge current per line (based on 8/20μs waveform).

4) Be designed specifically for the associated network connection type (Ethernet, RS485, RS232, etc.).

5) Be MTL Zonebarrier series or equal.

7. Antenna Cable Terminations Surge Protection:

a. Provide surge protection device at the connection of antenna cable to the radio panel. Device shall:

1) Be mounted internal to the associated panel.

2) Provide coarse protection via replaceable gas-filled surge voltage arrestor

3) Be Phoenix Contact CN-LAMBDA series or equal.

C. Installation and grounding of suppressor: As directed by manufacturer. Provide coordination and inspection of grounding.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE & HANDLING

A. Provide Site and warehouse storage facilities for all equipment.

B. Prior to shipment, include corrosive-inhibitive vapor capsules in shipping containers, and related equipment as recommended by the capsule manufacturer.

C. Prior to installation, store items in dry indoor locations. Provide heating in storage areas for items subject to corrosion under damp conditions.

D. Cover panels and other elements that are exposed to dusty construction environments.

3.02 INSTALLATION

A. Provide enclosure mounting supports as required for floor, frame or wall mounting. All supports in exterior, wet or process areas shall be stainless steel unless noted otherwise. All floor-mounted panels or other similar distribution equipment shall be mounted on 6" concrete housekeeping pads unless specifically shown otherwise. The general design intent is that centers of control panels be mounted at heights that are easily accessible. Design intent is that devices on panel fronts (pushbuttons, selector switches, pilot lights, HMIs, ETMs, breaker handles, etc.) generally be mounted as close to 5'-0"a.f.f. as possible, no higher than 6'-7"a.f.f (per NEC requirements) and no lower than 3'-6"a.f.f., where possible, without specific approval of the OWNER or ENGINEER. Additionally, every effort shall be made to provide a professional, consistent, neat, and workmanlike finished appearance of panel installations. For example, tops of adjacent panels shall be mounted at matching heights where possible/reasonable.

B. All enclosures used outside shall be solid bottom unless otherwise specified. All cable and piping openings shall be sealed watertight. Cable and piping shall enter the enclosure as shown on drawings or specified herein.

C. All equipment and components shall be solidly grounded to the control panel. One grounded terminal unit shall be provided in each control panel for connection to plant ground system. Grounding digital and analog components shall be performed in accordance with the instrument supplier's installation recommendations. Signal ground shall be solidly connected to the ground system so as to prevent ground loops

3.03 PAINTING

A. For enclosures other than NEMA 4X stainless steel or fiberglass:

1. Completely clean all surfaces so that they are free of corrosive residue. Then, phosphatize all surfaces for corrosion protection.

2. Prime with two (2) coats and finish with one coat of factory finish textured polyurethane. Paint shall be Sherwin-Williams Polane "T" or approved equal.

3. Color to be selected during shop drawing review phase.

3.04 IDENTIFICATION & DOCUMENTATION

A. Refer to specification SECTION 26 05 53 for additional requirements.

B. Control panel power supply source, type, voltage, number or circuit ratings shall be identified inside control panels and on drawings.

C. All interior devices and components shall be identified with thermal transfer labels with black letters on white background. Labels shall be placed on the subpanel and not the component. Marking system shall be a Brother "PTouch II" or equal. Lettering shall be 1/4" high.

D. All front panel mounted devices such as push buttons shall be identified by the use of engraved bakelite nameplates or legend plates. Nameplates shall be 1/8" thick, white with black core.

E. Where a panel includes a PLC or other network-connected device that is intended to be connected to another system (such as a plant SCADA system) via a network connection, the panel supplier shall provide an Interface Control Document (ICD) to the other system supplier (such as the SCADA Integrator). This document shall itemize the following for each networked parameter that is capable of being monitored or controlled by the other system:

   1. Parameter Name/Function (ex: Pump No. 1 On/Off Status)

   2. Parameter Type (discrete or analog, input or output)

   3. Parameter register ID/location

F. Where a panel includes a touchscreen or other programmable HMI display and is to be monitored by another system (such as a plant SCADA system), the panel supplier shall provide copies of the HMI display code and screenshots of all proposed HMI screens to the other system supplier (such as the SCADA Integrator) for their use in duplicating the associated HMI.

G. A job-specific, custom wiring diagram for each control panel (not including control stations without relays) shall be provided to the CONTRACTOR prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all control components connected to the panel (whether the components are mounted internal or external to the enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated panel, and submitted to the OWNER with the as-built documentation.

3.05 OWNER TRAINING

A. Fully train the OWNER in the proper operation of all control panels/equipment, describing and demonstrating full operation, including function of each door-mounted device.

3.06 SPARE EQUIPMENT

A. Provide the following spare equipment:

1. Fuses: 10% (minimum of 3) of each size and type utilized, mounted within a pocket within the associated control panel.

2. Where control panel contains programmable controller (or similar equipment): Flash drive containing copies of all final programs utilized within the control panel, with provisions/cable assemblies as required to connect the flash drive provided to the controller to download the programs. Flash drive shall be attached to retractable cord (long enough to reach the associated port) attached to the inside of the panel door.

END OF SECTION

SECTION 26 43 00
SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (<1000 V) power distribution and control equipment.

B. The specified unit(s) shall provide effective high energy transient voltage surge suppression, surge current diversion and high frequency noise attenuation in all electrical modes for equipment connected downstream from the facility's meter or load side of the main overcurrent device. The unit(s) shall be connected in parallel with the facility's wiring system.

C. The unit(s) shall be designed and manufactured in North America by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacturer of such products for minimum of ten (10) years.

D. All products that are submitted according to these specification will be required to meet this specification in its entirety for both service and distribution TVSS systems. Any product that is submitted and does not comply with all parts of this specification will be subject to rejection.

1.03 DEFINITIONS

A. VPR: Voltage Protection Rating.

B. SPD: Surge Protective Device(s)

C. I(n): Nominal Discharge Current

1.04 SUBMITTALS

A. See specification SECTION 26 05 00.

B. Product Data: For each type of product indicated. Include:

1. Maximum Single Impulse Surge Current Rating.

2. Surge Life (Repetitive Surge) Rating.

3. UL1449 (Latest Edition) Voltage Protection Ratings (VPR).

4. UL1449 (Latest Edition) Nominal Discharge Current (In).

5. Product dimensions and weights.

6. Furnished specialties and accessories.

C. Qualification Data:

D. Safety Agency File Number.

E. ISO 9001-2008 Certification.

F. ISO 1401-2001 Certification.

G. Operation and Maintenance Data: For SPDs to include all submittal data and any applicable operation and maintenance manuals.

H. Warranties: Sample of special warranties.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

B. The unit shall be UL 1449 Listed and CUL Approved as a Surge Protective Device and UL 1283 Listed as an Electromagnetic Interference Filter

C. Provide 2nd party certified data demonstrating SPD response to ANSI/IEEE C62.41.2-2002 standard waveforms when tested according to IEEE C62.45.

D. Comply with NFPA 70.

E. All SPDs provided within this project at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

1.06 PROJECT CONDITIONS

A. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.

2. Operating Temperature: 30 to 150 deg F.

3. Humidity: 0 to 95 percent, non-condensing.

4. Altitude: Less than 13,000 feet above sea level.

1.07 COORDINATION

A. Where field-mounted SPD's are specifically shown on plans, coordinate locations of field-mounted SPDs to allow adequate clearances for maintenance.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

1.09 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replaceable Protection Modules: 1 of each size and type installed, where field-replaceable modular SPDs are provided.

2. Fuses: 1 of each size and type installed, where field-replaceable fuses are provided.

PART 2 - PRODUCTS

2.01 SURGE PROTECTIVE DEVICES

A. Manufacturer:

1. Integral Devices: Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.), or by Surge Suppression Inc. if all of the performance of this specification are met and all UL listing of the equipment manufacturer are met.

2. External Devices (where specifically specified on plans): Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.) or Surge Suppression Inc.

B. Each Surge Protective Device shall:

1. Be internal to the associated distribution equipment (without violating any applicable UL listings) unless specifically shown otherwise on plans.

2. Be UL 1449 (Latest Edition) listed.

3. Have short-circuit current rating complying with UL 1449 (Latest Edition), that matches or exceeds the short-circuit rating of the associated distribution equipment.

4. Be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.

5. Have fuses, rated at 200-kA interrupting capacity.

6. Have a minimum UL 1449 Nominal Discharge Current (In) Rating of 20kA.

7. Be fabricated using bolted compression lugs.

8. Provide suppression for seven (7) modes of protection.

9. Have LED indicator lights for power and protection status of each phase.

10. Have audible alarm, with silencing switch, to indicate when protection has failed.

11. Have form-C contacts rated at 2 A and 24-V ac minimum, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with facility monitoring and control system if monitoring by that system is required by plans or other specifications.

12. Have six-digit transient-event counter, mounted to front of equipment door, set to totalize transient surges (externally mounted SPD's may have the transient –event counter mounted on the visible face of the SPD).

13. Meet all UL 96A requirements (for Lightning Protection Systems) where the device is installed at a service entrance of the facility. At a minimum, these devices shall:

    a. Be marked as Type 1 or Type 2 SPDs with product Identity consisting of "Surge Protective Device" or "SPD", and identifying all ratings so required by UL96A and the 4 digit alpha numeric Control Number.

    b. Have a minimum UL 1449 Nominal Discharge Current (In) Rating of 20kA.

    c. Be UL listed and labeled with holographic label.

C. Peak Single-Impulse Surge Current Rating shall be meet the following minimums unless specifically shown otherwise on plans:

Application	Per Phase	Per Mode
Service Entrance Devices	240 kA	120 kA
Downstream Devices	160 kA	80 kA

D. The ANSI/UL 1449 voltage protection rating (VPR) in grounded wye circuits, the SPDs shall not exceed the following:

Modes	208Y/120V	480Y/277V	600Y/347V
L-N,L-G, N-G	800	1200	1500
L-L	1200	2000	2500

E. The ANSI /UL 1449 VPR for 240/120 V, 3-wire or 4-wire circuits with high leg shall not exceed the following:

Modes	240/120V
L-N,L-G, N-G	1200/800

2.02 ENCLOSURES

A. Where external units are specifically specified on plans, units not mounted within electrical distribution equipment (such as switchboards, MCC's, etc.) shall be provided in enclosures with NEMA enclosure ratings that match or exceed the NEMA enclosure ratings of the equipment from which the units are fed. For example, a unit fed from a NEMA 4X stainless steel panelboard shall also be mounted within a NEMA 4X stainless steel enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All SPD's shall be integrally-mounted within the associated distribution equipment unless specifically shown otherwise on plans.

B. Install SPDs at service entrance on load side, with ground lead bonded to service entrance ground.

C. Install SPDs downstream of the service entrance with conductors or buses between suppressor and points of attachment as short and straight as possible. The lead lengths between the TVSS unit and the equipment being protected shall not exceed fourteen (14) inches without approval from the ENGINEER. Do not bond neutral and ground. Leads shall be as straight as possible with no sharp bends.

D. Where externally-mounted SPD's are specifically shown on plans, provide circuit breaker as directed by the SPD supplier as a dedicated disconnecting means for SPD unless otherwise indicated.

3.02 FIELD QUALITY CONTROL

A. Ensure that interiors are free of foreign materials and dirt.

B. Check and test switches, pushbuttons, meters for proper operation.

C. Check and test indicating lights for proper operation and color.

D. Perform manufacturer's on site field test procedures.

3.03 STARTUP SERVICE

A. Do not perform insulation resistance (MEGGER) tests of the distribution wiring equipment with the SPDs installed. Disconnect all wires, including neutral, before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.04 SYSTEM WARRANTY

A. The SPD system manufacturer shall warranty the entire SPD system against defective materials and workmanship for a period of ten (10) years from the date of substantial completion. This warranty is in effect as long as the unit is installed in compliance with the manufacturer's installation, operation, and maintenance manual, UL Listing requirements, and any applicable national or local electrical codes.

B. Any SPD device which shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced by the manufacturer at no charge to the OWNER. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period, which starts at the date of substantial completion of the system to which the surge suppressor is installed.

C. The manufacturer is required to have a nationwide network of factory-authorized local service representatives for repair and service of this product. The manufacturer shall have a dedicated 1-800 telephone number for service problems and questions. This number shall be manned by a knowledgeable factory employee to ensure prompt response to any emergency situation that may arise.

END OF SECTION

SECTION 26 50 00
LIGHTING MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Lighting Fixtures

B. Drivers

1.02 SUBMITTALS

A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicated that the CONTRACTOR/supplier intends to meet all contract requirements. Refer to specification SECTION 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of CONTRACTOR to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.

B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.

C. All lighting fixtures shall be so designed and shall have drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by ENGINEER, at CONTRACTOR's expense.

D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting or other means as required to maintain the fire rating of the assembly.

2.02 LED LUMINAIRES

A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.

B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.

C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.

D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.

E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail "open" such as to prevent fixture operation after a surge protection failure.

F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.

G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

2.03 STEMS/PENDANTS

A. Hangers shall be approved ball aligner type swivel, 30 degrees from vertical with swivel below canopy.

B. Stems/Pendants shall be rigid conduit unless specified otherwise on plans. Proposed stem/pendant types shall be submitted for review prior to shipment of light fixtures from factory.

C. Stems/Pendants shall be provided as required to prevent swaying of fixtures due to HVAC system airflow or other similar occurrences.

D. Shall be painted the same color as the fixture trim unless noted otherwise.

2.04 MANUFACTURER

A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.

B. Drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF LIGHTING FIXTURES

A. Support:

1. Support of all lighting fixtures shall be responsibility of Electrical Contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.

2. CONTRACTOR shall coordinate installation requirements for all wall-mounted fixtures (especially for wall-mounted fixtures on uneven wall surfaces, etc.) as required to assure a level/flat mounting surface and level/plumb/secure finished installation. CONTRACTOR shall provide flat mounting plates or other mounting provisions where necessary. Any proposed mounting plates, etc. shall be submitted to and approved by project architect prior to ordering materials.

3. Fixtures shall be supported independent of ceiling from structural members of building.

4. Lay-in fixtures shall be supported by four (4) taut 12 gauge hanger wires connected from each corner of the fixture to the structure above so that fixture is supported independent of the ceiling.

5. Other recessed light fixtures (including recessed downlights) shall be supported with two (2) taut 12 gauge hanger wires connected from opposing corners of the light fixture to the structure above so that fixture is supported independent of the ceiling.

6. Pendant mounted fixtures shall be directly supported from the structure above using a 9 gauge hanger wire or an approved alternate support without using the ceiling suspension system for direct support.

7. Tandem fixtures may utilize common hanger wires.

8. All lay-in fixtures shall be attached to ceiling grid by means of approved clips and in accordance with the N.E.C.

9. CONTRACTOR shall submit typical hanging detail to ENGINEER before installing any fixtures.

B. Connections:

1. All grid fixtures shall be wired by flex individually to junction and not wired fixture to fixture.

2. All flex shall contain 3 conductors (3rd wire ground). Ground wire shall be securely grounded at each end. Other conductors shall be connected by approved connectors.

C. Row-Mounted fixtures:

1. All stems on row-mounted fluorescent fixtures shall be installed as follows (except fixtures with slide grip hangers):

a. One stem shall be installed in the first fixture knockout from end of row (on the first and last fixture of the row).

b. One stem shall be installed between each two fixtures. Stem shall center joint where fixtures join and shall attach by use of "joining plates".

2. All fixtures in continuous rows other than recessed grid type shall be connected by nipples with locknuts bushings.

D. Coordination:

1. CONTRACTOR shall coordinate all dimensions & locations of light fixtures prior to rough-in to ensure proper fit and coordination with other trades.

2. CONTRACTOR shall verify exact location of light fixture with Reflected Ceiling Plan. If there are any discrepancies, verify exact location with architect.

3. CONTRACTOR shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION

SECTION 27 05 00
AUXILIARY SYSTEM CABLES, 0-50V

PART 1 - GENERAL

1.01 DESCRIPTION

A. Cables rated for 0V-50V application

PART 2 - PRODUCTS

2.01 GENERAL

A. Unless specified otherwise, all cables within the scope of this specification section shall:

1. Be rated for exposed cable tray installation.

2. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).

3. Be UL-rated for the proposed application.

4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.

5. Utilize copper conductors.

6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.

7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.

8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

2.02 INSTRUMENTATION CABLING

A. In addition to above requirements, and unless specified otherwise, Instrumentation cabling shall:

1. Be #16awg minimum.

2. Be rated for 300V.

3. Have aluminum foil shielding.

4. Have stranded, twisted conductors.

5. Have PVC insulation/jacket with ripcord.

6. Be manufactured by Belden, AlphaWire or General Cable.

2.03 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:

1. Be rated for 600V.

2. Be industrial grade.

3. Have stranded conductors.

4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.

5. Be manufactured by Belden, AlphaWire or General Cable.

2.04 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:

1. Be rated for 300V.

2. Be shielded if so recommended by the system supplier/integrator.

3. Have twisted conductors.

4. Have plenum-rated insulation/jacket with ripcord.

5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

2.05 NETWORK CABLING

A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Routing:

1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:

    a. Cabling is plenum-rated, multi-conductor.

    b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.

    c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.

    d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).

    e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.

2. End bushings shall be provided on both ends of all raceway terminations.

3. No splices shall be pulled into conduit.

4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

2. For cabling not installed in conduit:

    a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

3. For cabling installed within conduit from endpoint to endpoint:

    a. Fire/smoke barrier penetrations shall sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.

4. For cabling installed within cable trays:

a. Fire/smoke barrier penetrations shall be sealed with one of the following methods:

1) Continuous cable tray through the penetration, with a combination of large firestop pillows and small firestop pillows contained, supported and secured (to prevent unauthorized removal) on both sides by aluminum wire mesh and firestop putty. Firestop pillows shall be STI Series SSB or equal and Firestop putty shall be STI Spec Seal or equal.

2) Cable tray broken at the penetration, with fire/smoke barrier penetrations sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

C. Excess Cabling:

1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

D. Terminations:

1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.

2. Cabling shall be neatly formed, bundled and tied at all terminations.

3.02 SPLICES/CONNECTIONS/TERMINATIONS:

A. Network Cabling:

1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

B. Control Cabling:

1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

C. Shielded cabling:

1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a

termination kit as directed by the PLC/control panel supplier.

2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the ENGINEER.

3.03 LABELING

A. Refer to Specification SECTION 26 05 53 for all labeling requirements.

END OF SECTION

SECTION 31 05 13
SOIL MATERIALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Subsoil materials

B. Topsoil materials

1.02 RELATED SECTIONS

A. SECTION 31 22 13 – Rough Grading

B. SECTION 31 23 33 - Trenching and Backfill

1.03 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

E. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

F. ASTM D2487 - Classification of Soils for Engineering Purposes.

G. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

H. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

PART 2 – PRODUCTS

2.01 SUBSOIL MATERIALS

A. Subsoil Type S2:

1. Excavated and re-used material or imported borrow.

2. Graded.

3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

2.02 TOPSOIL MATERIALS

A. Topsoil Type S4:

1. Excavated and reused material.

2. Graded.

3. Free of roots, rocks larger than ½ inch, subsoil, debris, large weeds and foreign matter.

2.03 AGGREGATE FILL MATERIALS

A. Aggregate fill Type A1:

1. Limestone aggregate meeting ALDOT requirements for a No. 57 stone or smaller.

PART 3 – EXECUTION

3.01 SOIL REMOVAL

A. Excavate subsoil and topsoil as shown on finished contours.

B. Remove lumped soil, boulders, and rock.

C. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.02 STOCKPILING

A. Stockpile materials off site at locations approved by the OWNER.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.03 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Removal of surface debris

B. Removal of paving, curbs, and sidewalks

C. Removal of trees, shrubs, and other plant life

1.02 RELATED SECTIONS

A. SECTION 31 22 13 – Rough Grading

1.03 REGULATORY REQUIREMENTS

A. Conform to State and local laws and ordinances for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.

B. Coordinate clearing Work with utility companies.

C. The CONTRACTOR is responsible for obtaining any storm water discharge permits required during construction unless previously obtained by the OWNER or ENGINEER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PREPARATION

A. Verify that existing plant life designated to remain is tagged or identified. Contact the property owners at properties that will be affected by this project and have the property owners identify any plants or items they want moved out of the construction zone. If feasible, CONTRACTOR shall move the requested items.

B. Identify an area offsite that meets local laws and ordinances for placing removed materials.

C. Locate all existing utilities and notify ENGINEER of possible conflicts.

D. PROTECTION

E. Locate, identify, and protect utilities that remain from damage.

F. Protect trees, plant growth, and features designated to remain, as final landscaping.

G. Protect benchmarks, survey control points, and existing structures from damage or displacement.

H. Protect adjoining property from damage. CONTRACTOR is responsible for any damage that is caused as a result of this project.

I. CONTRACTOR to remove all vegetation within the work area and dispose of offsite.

3.02 CLEARING

A. Clear areas required for access to site and execution of Work. Keep disturbance to a minimum.

B. Remove and dispose of trees and shrubs as needed within the boundaries of the project. Remove stumps. Approval must be obtained from ENGINEER or OWNER before any cutting of trees or shrubs will be allowed.

C. Clear undergrowth and dead wood, without disturbing subsoil.

D. Apply herbicide to remaining stumps and roots to inhibit growth.

3.03 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

~~B. Partially remove and dispose all paving, curbs, and sidewalks; as indicated on the Plans. Neatly saw cut edges at right angle to surface.~~

END OF SECTION

SECTION 31 22 13
ROUGH GRADING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil and subsoil.

B. Cutting, grading, filling, rough contouring, compacting, and preparing the site for building pads, paving, curb and gutter, sidewalks, etc.

1.02 RELATED SECTIONS

A. SECTION 31 10 00 - Site Clearing

B. SECTION 31 05 13 – Soil Materials

1.03 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10 lb Rammer and an 18m inch Drop.

B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

D. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

E. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

F. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

G. ASTM D2419 - Test Method For Sand Equivalent Value of Soils and Fine Aggregate.

H. ASTM D2434 - Test Method For Permeability of Granular Soils (Constant Head).

I. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

J. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Topsoil: Type S4 as specified in SECTION 31 05 13

B. Subsoil Fill: Type S2 as specified in SECTION 31 05 13.

C. Structural Fill: Type S2 as specified in SECTION 31 05 13.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify site conditions.

B. Verify that the survey benchmark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect utilities that remain from damage.

D. Protect above and below-grade utilities that remain.

E. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

F. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.03 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded as indicated on the finished contours plan.

B. Do not excavate wet subsoil.

C. When excavating through roots, perform work by hand and cut roots with a sharp axe.

D. Stockpile in the area approved by the OWNER to a depth not exceeding 8 feet and protect from erosion. Remove from the site; subsoil is not being reused.

E. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide a firm bearing.

F. Stability: Replace damaged or displaced subsoil to the same requirements as for specified fill.

3.04 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Maintain optimum moisture content of fill materials to attain required compaction density.

C. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise.

D. Make grade changes gradual. Blend slope into level areas.

E. Remove surplus fill materials from site.

3.05 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 of a foot from required elevation.

END OF SECTION

SECTION 31 23 00
EARTHWORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Protection, modification, or installation of utilities as site work progresses with particular attention to grade changes and necessary staging or phasing of work.

B. Cutting, filling, and grading to required lines, dimensions, contours, and elevations for proposed improvements.

C. Scarifying, compacting, drying, dewatering and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition

1. D422 Standard Test Method For Particle – Size Analysis of Soil

2. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN.m/m3))

3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 Kn.m/m3))

4. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures

5. D 2487 Classification of Soils for engineering Purposes

6. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

7. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

8. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition

1. T 88 Particle Size Analysis of Soils

2. State Department of Transportation (DOT): Standard Specifications for Construction and Materials, Latest Edition

1.03 QUALITY ASSURANCE

A. An independent testing laboratory, selected and paid by OWNER, will be retained to perform construction testing on site.

1. The independent testing laboratory shall prepare test reports that indicate test location, elevation data, and test results. OWNER, Civil Engineering Consultant, and CONTRACTOR shall be provided with copies of reports within 96 hours of time that test was performed. In event that test performed fails to meet Specifications, the independent testing laboratory shall notify OWNER and CONTRACTOR immediately.

2. Costs related to retesting due to failures shall be paid for by CONTRACTOR at no additional expense to OWNER. CONTRACTOR shall provide free access to site for testing activities.

3. Quality assurance testing shall be in accordance with Part 3, Section 3.07, "Field Quality Control".

1.04 SUBMITTALS

A. Submit 30-pound sample of each type of fill/backfill material that is to be used in airtight container(s) to the independent testing laboratory for classification and certification of material.

B. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of OWNER.

C. If fabrics or geogrids are to be used, design shall be submitted for approval to OWNER.

D. Submit Dewatering Plans upon request by OWNER.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Excavated and re-used material for subsoil fill as specified herein.

B. Aggregate fill as specified in SECTION 31 05 13.

C. Imported fill material approved by OWNER and specified herein.

D. Topsoil fill as specified in SECTION 31 05 13.

E. Filter and drainage fabrics as specified in SECTION 01 57 13.

2.02 EQUIPMENT

A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.03 SOURCE QUALITY CONTROL

A. In areas to receive pavement, California Bearing Ratio (CBR) test shall be performed for each type of material that is imported from off-site. Acceptable California Bearing Ratio (CBR) shall be 10.

B. Following tests shall be performed as part of construction testing requirements on each type of on-site or imported soil material used as compacted fill:

1. Moisture and Density Relationship: ASTM D 698 (or ASTM D 1557)

2. Mechanical Analysis: AASHTO T 88 (or ASTM D422)

3. Plasticity Index: ASTM D 4318

PART 3 – EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Locate and identify existing utilities that are to remain and protect from damage.

C. Notify utility companies to remove or relocate public utilities that are in conflict with proposed improvements.

D. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs, unless otherwise noted on construction drawings from excavating equipment and vehicular traffic.

E. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker is destroyed or needs to be removed it shall be reset by licensed land surveyor and replaced, as necessary, by same.

F. Remove from site, material encountered in grading operations that, in opinion of OWNER or Agent, is unsuitable or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to OWNER. Backfill areas with layers of suitable material and compact as specified herein.

G. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:

1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.

2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.

3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation by OWNER or Agent. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 10'-0" of perimeter of building subgrade or paving subgrade. If, after observation by OWNER or Agent, material is found to be unsuitable, unsuitable material shall be removed from site.

H. Undercut and recompact loose sands in the upper 2 to 3 feet of existing grade prior to placement of any fill.

I. Prior to constructing any slopes, begin by undercutting the toe to key in the fill mass to be constructed. Provide benches into existing slopes in accordance with the construction drawings.

3.02 EXCAVATION FOR FILLING AND GRADING

A. Classification of Excavation: CONTRACTOR acknowledges that site has been investigated to determine type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in the Contract Documents.

B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.

C. Shore, brace, and dewater excavations as necessary to maintain excavation in accordance with OSHA regulations.

D. Excavated material containing rock or stone greater than 4-inches in largest dimension shall not be used within the upper 24-inches of proposed subgrade in parking and drive areas and within 48" of the subgrade of building areas to 10 feet outside of the building area.

E. Rock or stone less than 12-inches in largest dimension is acceptable as fill to within the upper 24-inches of proposed subgrade in parking and drive areas, and 48" of the subgrade of building areas to 10 feet outside of the building area.

F. Rock or stone less than 4-inches in largest dimension and mixed with suitable material is acceptable as fill within the upper 24-inches of proposed subgrade in parking and drive areas, and 48" of the subgrade of building areas to 10 feet outside of the building area.

3.03 FILLING AND SUBGRADE PREPARATION

A. Fill areas to contours and elevations shown on Construction Drawings with unfrozen materials.

B. Place fills in continuous lifts specified herein.

C. Subgrade areas exposed by excavation or stripping subgrade shall be scarified to minimum depth of 8-inches and compacted to minimum of 98 percent of maximum density, in accordance with ASTM D 698. Moisture content shall be within 2 percent of optimum moisture content. These areas shall then be proofrolled to detect areas of insufficient compaction. Proofrolling shall be accomplished by making minimum of 2 complete passes with fully-loaded tandem-axle dump truck with a maximum weight of 20 tons, or approved equal, in each of 2 perpendicular directions while under the supervision and direction of the independent testing laboratory. Areas of failure shall be excavated and recompacted as specified herein. Continual failure areas shall be stabilized at no additional cost to OWNER.

D. Fill materials used in preparation of subgrade in all areas other than structures, utilities, or pavements(see related sections for backfilling within these areas) shall be placed in lifts or layers not to exceed 8-inches loose measure and compacted to 98 percent of maximum density, in accordance with ASTM D 698. Moisture content shall be within 2 percent of optimum moisture content.

E. Material imported from off-site shall have CBR value equal to or above pavement design of 10

3.04 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.05 BORROW AND SPOIL SITES

A. CONTRACTOR shall be responsible for compliance with NPDES and local erosion control permitting requirements for any and all, on-site and off-site, disturbed spoil and borrow areas. Upon completion of spoil and/or borrow operations, the CONTRACTOR shall clean up spoil and/or borrow areas in a neat and reasonable manner to the satisfaction of off-site property owner, if applicable, OWNER, and Engineering

Consultant

3.06 RIPRAP

A. Place rip-rap in areas where indicated on Construction Drawings. Stone for rip-rap shall consist of field stone or rough unhewn quarry stone as nearly uniform in section as is practical. Stones shall be dense, resistant to action of air and water, and suitable for purpose intended. Unless otherwise specified, stones used as rip-rap shall weigh between 50-pounds and 150-pounds each, and at least 60 percent of stones shall weigh more than 100-pounds each.

B. Dress slopes and other areas to be protected to line and grade shown on Construction Drawings prior to placing of rip-rap. Undercut areas to receive rip-rap to elevation equal to final elevation less average diameter of stones before placing rip-rap.

C. Install filter fabric and bedding stone prior to placement of stones if so indicated on Construction Drawings. Bedding stone shall be quarried and crushed angular limestone, 6-inches in depth in accordance with Section 31 05 13. Filter fabric shall be as specified in Section 01 57 13 and as detailed on Construction Drawings.

D. Place stones so that greater portion of weight is carried by earth and not by adjacent stones. Place stones in single layer with close joints. Upright areas of stone shall make angle of approximately 90 degree with embankment slope. Place courses from bottom of embankment upward, with larger stones being placed in lower courses. Fill open joints and embed stones in embankment as necessary to present uniform top surface such that variation between tops of adjacent stones shall not exceed 3-inches.

3.07 FINISH GRADING

A. Grade areas where finish grade elevations or contours are indicated on Construction Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10-feet above or below established finished subgrade elevation. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential. For topsoil, sodding and seeding requirements refer to Section 01 57 13.

B. Correct settled and eroded areas within 1 year after date of completion at no additional expense to OWNER. Bring grades to proper elevation. Replant or replace grass, shrubs, bushes, or other vegetation that appears dead, dying, or disturbed by construction activities.

3.08 FIELD QUALITY CONTROL

A. Field density tests for in-place materials shall be performed as part of construction testing requirements according to one of following standards:

1. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission)

B. Perform density test as follows:

1. Building Subgrade Areas, Including 10'-0" Outside of Exterior Building Lines: In cut areas, not less than 1 compaction test for every 2,500 sq. ft. In fill areas, same rate of testing for each 8-inch lift, measured loose.

2. Areas of Construction Exclusive of Building Subgrade Areas: In cut areas, not less than 1 compaction test for every 10,000 sq. ft. In fill areas, same rate of testing for each 8-inch lift, measured loose.

C. Corrective measures for non-complying compaction:

1. Remove and recompact deficient areas until proper compaction is obtained at no additional expense to OWNER.

END OF SECTION

SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Excavating trenches for utilities.

B. Compacted fill from the top of utility bedding to subgrade elevations.

C. Backfilling and compaction.

1.02 RELATED SECTIONS

A. SECTION 31 05 13 – Soil Materials.

B. SECTION 33 30 00 – Sanitary Sewerage

1.03 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

D. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

E. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

F. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

G. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

H. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.05 FIELD MEASUREMENTS

A. Verify that the survey benchmark, control point, and intended elevations for the Work are as shown on drawings.

1.06 COORDINATION

A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Fill Type S2: As specified in SECTION 31 05 13.

B. Structural Fill Type A1: As specified in SECTION 31 05 13.

C. Concrete: Concrete thrust blocks are to be cast in place with a compressive strength of 3,000 psi.

PART 3 – EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

C. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Maintain and protect above and below-grade utilities, which are to remain.

E. Cut out soft areas of sub-grade not capable of compaction in place. Backfill with Fill Type S2 or A1 and compact to a density equal to or greater than requirements for subsequent backfill material.

3.02 EXCAVATING

A. Excavate subsoil required for utilities.

B. Cut trenches sufficiently wide to enable installation and allow inspection. Minimum width of trenches shall be as indicated in the plans. Remove water or materials that interfere with Work.

C. Do not interfere with 45 degrees bearing splay of foundations.

D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

E. Remove lumped subsoil, boulders, rock, organic materials, and debris.

F. Correct areas over-excavated by backfilling with appropriate material.

G. Stockpile excavated material in area designated on site and removed excess material not being used from the site.

3.03 BACKFILLING

A. Backfill trenches to contours and required cover with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy sub-grade surfaces.

C. Granular Fill A1: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

D. Soil Fill Type S2: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.

E. Employ a placement method that does not disturb or damage utilities in the trench.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Remove surplus fill materials from the site.

3.04 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.06 SCHEDULE

A. Sewer Main – Type 3 Laying Condition (Normal Soil):

1. Pipe bedded in loose consolidated soil type S-2; 4-inch minimum.

2. Backfill to a minimum cover of 36" above pipe with lightly consolidated Fill Type S2.

3. A minimum of 4 inches of topsoil type S4 at the surface

B. Sewer Main – Type 4 Laying Condition (Normal Soil):

1. Pipe bedded in aggregate type A-1; 4 inch minimum.

2. Backfill to a minimum cover of 36" above pipe with Fill Type S2, in 12 inch lifts, compacted to 80 percent Standard Proctor, AASHTO T-99.

3. A minimum of 4 inches of topsoil type S4 at the surface

C. Sewer Main – Type 5 Laying Condition (Laying in Rock):

1. Pipe bedded in aggregate type A-1; 4 inch minimum.

2. Backfill to top of the pipe with aggregate type A-1; compacted in 8" lifts to 90 percent Standard Proctor, AASHTO T-99.

3. Backfill remainder to a minimum cover of 36" above pipe with Fill Type S2, in 12 inch lifts, compacted to 80 percent Standard Proctor, AASHTO T-99.

4. A minimum of 4 inches of topsoil type S4 at the surface

D. Sewer – Beneath roadways and drives:

1. Pipe bedded in aggregate type A-1; 4 inch minimum.

2. Backfill remainder to a minimum cover of 36" above pipe with Fill Type A-1, in 8 inch lifts, compacted to 90 percent Standard Proctor, AASHTO T-99.

END OF SECTION

SECTION 31 37 16
RIP RAP

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. RIP RAP

1.02 RELATED SECTIONS

A. SECTION 31 22 13 – Rough Grading.

B. SECTION 31 23 33 – Trenching and Backfilling

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Rip rap: By the ton.

B. Geotextile Fabric: Subsidiary to the riprap tonnage price.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ALDOT standards.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Rip rap: ALDOT Class I Rip rap material consisting of graded stones ranging from 10 to 100 pounds with not more than 10% having a weight over 100 pounds and at least 50% having a weight over 50 pounds and not over 10% having a weight under 10 pounds.

B. Rip rap: ALDOT Class IV Rip rap material consisting of graded stones ranging from 50 to 1,000 pounds with not more than 25% having a weight over 1000 pounds and at least 50% having a weight over 500 pounds and not more than 25% having a weight under 50 pounds.

C. Geotextile Fabric: Non-biodegradable, woven. Mirafi 180N or approved equal.

PART 3 – EXECUTION

3.01 PLACEMENT

A. Place geotextile fabric over the substrate, lap edges, and ends.

B. Place rip rap at embankment slopes as indicated.

C. Installed Thickness: 18-inch average.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, gutters, median barriers, parking areas, and roads.

1.02 RELATED SECTIONS

A. Alabama Standard Specifications for Roads and Bridges; State of Alabama Department of Transportation and Development; Latest Edition.

B. ACI 301 -Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.

C. ACI 305R -Hot Weather Concreting; American Concrete Institute International; 1999.

D. ACI 306R -Cold Weather Concreting; American Concrete Institute International; 1988.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

A. Wood or Steel form material, profiled to suit conditions.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D 1751), sponge rubber or cork (ASTM D 1752), or Treated Redwood with cap or bonded and pressed fiber board with cap or Engineer approved equal.

1. Thickness: 1/2" inch unless specified otherwise.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280); deformed billet steel bars; unfinished finish.

B. Steel Welded Wire Reinforcement: Plain type, ASTM A 185/A 185M; in flat sheets; unfinished.

C. Dowels: ASTM A 615/A 615M Grade 40 (280); deformed billet steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Concrete Materials: Provide in accordance with State of Alabama Highways standards.

2.04 ACCESSORIES

A. Joint Sealer Requirements:

1. Type: S – Single Component.

2. Grade: P -Pourable or Self-Leveling used for horizontal traffic joints.

3. Use: T -Traffic.

4. Immersion rated sealant applications require primer.

5. Color: gray or stone

B. Joint Cleaner:

1. Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Primer:

1. Non-staining type, recommended by sealant manufacturer to suit the application.

D. Joint Backing:

1. Round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit the application.

E. Bond Breaker:

1. Pressure sensitive tape recommended by sealant manufacturer to suit application.

F. Masking tape:

1. Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

2.05 CONCRETE MIX DESIGN

A. Concrete mix shall conform to Section 109 of the Alabama Standard Specifications for Highway Construction, 2018 Edition.

B. Concrete Properties:

1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days. As indicated on drawings.

2.06 MIXING

A. On Project Site:

1. Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers:

1. Comply with ASTM C 94/C 94M.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of the base are correct.

3.02 SUB BASE

A. Prepare subbase in accordance with State of Alabama Department of Transportation standards.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bonding with concrete pavement.

C. Notify the Engineer minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertically in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement as indicated.

B. Interrupt reinforcement at contraction joints.

C. Place dowels to achieve pavement and curb alignment as detailed.

3.06 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow the recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when the base surface temperature is less than 40 degrees F, or the surface is wet or frozen.

3.07 PLACING CONCRETE

A. Place concrete in accordance with State of Alabama Department of Transportation standards.

B. Do not place concrete when the base surface is wet.

C. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.08 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 1/4 inch wide expansion joints at Locations as detailed on the drawing's foot intervals and to separate paving from vertical surfaces and other components and in the pattern indicated.

1. Form joints with joint filler extending from the bottom of the pavement to within 1/4 inch of the finished surface.

2. Secure to resist movement by wet concrete.

C. Provide keyed joints as indicated.

D. Saw cut contraction joints 1/8 -7/16 inch wide at an optimum time after finishing. Cut shall be at 1/4 of the depth of the slab.

3.09 JOINT SEALING

A. Examination

B. Verify substrate surfaces and joint openings are ready to receive work.

C. Verify joint surfaces are clean and dry.

D. Ensure concrete surfaces are fully cured.

E. Report unsatisfactory conditions in writing to the Engineer.

F. Do not proceed until unsatisfactory conditions are corrected.

3.10 PREPARATION

A. Prepare joints in accordance with ASTM C 1193 and manufacturer's instructions.

B. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bonds.

C. Clean concrete joint surfaces to remove curing agents and form release agents.

D. Protect elements surrounding the Work of this section from damage or disfiguration.

E. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3.11 SEALANT INSTALLATION

A. Install primer and sealants in accordance with ASTM C 1193 and the manufacturer's instructions.

B. Install joint backing to maintain the following joint ratios:

1. Joints up to 1/2 inch (13 mm) Wide: 1:1 width-to-depth ratio.

2. Joints Greater than 1/2 inch (13 mm) Wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.

3. Install a bond breaker where joint backing is not used.

4. Apply primer where required for sealant adhesion.

5. Install sealants immediately after joint preparation.

6. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

C. Joining Silicone and Polyurethane Sealants:

1. Install polyurethane sealants first.

2. Join silicone sealant to polyurethane in accordance with the manufacturer’s instructions.

3. Tool exposed joint surface concave.

3.12 CLEANING

A. Remove masking tape.

B. Clean adjacent surfaces soiled by sealant installation.

3.13 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

C. Maximum Variation From Design Thickness: 1/4 inch.

3.14 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in SECTION 32 12 16.

1. Provide free access to concrete operations at the project site and cooperate with the appointed firm.

2. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.15 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Seeding, mulching, and fertilizer.

B. Maintenance.

1.02 RELATED SECTIONS

A. SECTION 31 05 13 - Soil Materials: Topsoil material.

B. SECTION 31 23 33 - Trenching: Rough grading over cut.

C. SECTION 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this Section.

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Included in site work.

1.04 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.05 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.06 MAINTENANCE DATA

A. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height and types, application frequency, and recommended coverage of fertilizer.

1.07 QUALITY ASSURANCE

A. Provide seed mixture in containers showing the percentage of seed mix, year of production, net weight, date of packaging, and packaging location.

1.08 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide a certificate of compliance from an authority having jurisdiction indicating approval of seed mixture.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilized in waterproof bags showing weight, chemical analysis, and name of the manufacturer.

1.10 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until the grass is well established and exhibits a vigorous growing condition.

PART 2 – PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture:

1. Pensacola Bahia Grass: 20 lbs/acre.

2. Kentucky 31 Fescut: 20 lbs/acre.

3. Bermuda Grass (Hulled): 20 lbs/acre.

4. Reseeding Crimson Clover: 20 lbs/acre.

B. Recommended seed mixture may vary depending on the time of year.

2.02 SOIL MATERIALS

A. Topsoil: As specified in SECTION 31 05 13 – Soil Materials: Type S-4.

2.03 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources, of proportion necessary to eliminate any deficiencies of topsoil.

C. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

D. Erosion Fabric: Jute matting, open weave.

E. Stakes: Softwood lumber, chisel pointed.

F. String: Inorganic fiber.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that the prepared soil base is ready to receive the work of this Section.

3.02 FERTILIZING

A. Apply fertilizer in accordance with the manufacturer's instructions.

B. Apply after smooth raking of topsoil.

C. Do not apply fertilizer at the same time or with the same machine as will be used to apply seed.

D. Mix thoroughly into the upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.03 SEEDING

A. Apply seed at a rate of 2 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on the same day.

C. Do not sow immediately following rain, when the ground is too dry, or during windy periods.

D. Roll seeded area with roller not exceeding 112 lbs.

E. Immediately following seeding and compacting, apply mulch.

F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.04 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

B. Cover seeded slopes where the grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on the surface and bury the top end of each section in a 6 inch deep excavated topsoil trench. Provide a 12 inch overlap of adjacent rolls. Backfill the trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36-inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At the sides of ditches, lay fabric laps in the direction of water flow. Lap ends and edges minimum 6 inches.

3.05 MAINTENANCE

A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll the surface to remove minor depressions or irregularities.

F. Control the growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas, which show bare spots.

H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 33 01 10
VALVES FOR WATER AND SEWER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Tapping Sleeve and Valves
2. Rubber Seated Butterfly Valves
3. Resilient Wedge Gate Valves
4. Eccentric Plug Valves
5. Swing Check Valves
6. Silent Check Valves
7. Insertion Valves
8. Air/Vacuum and Air Release Valves (Including Combination Types)
9. Pilot Operated Control Valves
10. Line Stopping
11. Accessories

B. Related Sections:

1. Plans and general provisions of the Contract including General Conditions, Special Provisions and Technical Specifications.

1.02 REFERENCES

A. American Water Works Association:

1. AWWA C111 / A21.11-17 – Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
2. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
3. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray-Iron Fittings

4. AWWA C504 – Rubber-Seated Butterfly Valves

5. AWWA C508 – Swing Check Valves for Waterworks Service 2 in through 48 in

6. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service

7. AWWA C512 – Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.

8. AWWA C515 – Reduced Wall, Resilient-Seated Gate Valves for Water-Supply Service.

9. AWWA C517 – Resilient-Seated Cast Iron Eccentric Plug Valves

10. AWWA C530 – Pilot-Operated Control Valves

11. AWWA C541 – Hydraulic and Pneumatic Cylinder and Vane Type Actuators for Valves and Slide Gates

12. AWWA C542 – Electric Motor Actuators for Valves and Slide Gates

13. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.

14. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

B. National Sanitation Foundation:

1. NSF 61 - Drinking Water System Components - Health Effects

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Tapping Sleeve and Valve Assemblies:

1. Basis of Measurement: Each, unless otherwise noted in the Plans.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (includes rock excavation), installation of tapping sleeve and tapping valve, tap of existing line, removal of coupon, installation of associated valve riser (valve box), concrete ring around top of valve box, valve marker, general fill, testing, cleanup and restoration, and all related items.

B. Insertion Valves:

1. Basis of Measurement: Each, unless otherwise noted in the Plans.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (includes rock excavation), preparation of pipe at insertion site, and installation of the insertion valve assembly in accordance with the manufacturer's recommendations. Also includes installation of associated valve riser (valve box),

concrete ring around top of valve box, valve marker, general fill, testing, cleanup and restoration, and all related items.

C. Water and Sewer Valves:

1. Basis of Measurement: Each, unless otherwise noted in the Plans or if a portion of an assembly.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), connection and placement of valve, joint restraints, installation of associated valve riser (valve box), concrete ring around top of valve box, valve marker, general fill, compaction, cleanup and restoration, testing, and all related items.

D. Pilot Operated Control Valve Assemblies:

1. Basis of Measurement: Per Each or Lump Sum as indicated in the Proposal.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), valve vault, pilot operated control valve, associated internal and external piping as indicated in the plans, associated isolation valves as indicated in the Plans, drain piping as indicated in the Plans, related site work, general fill, compaction, cleanup and restoration, testing, start- up and commissioning services, and all related items.

E. Air Release and Air/Vacuum Valve Assemblies:

1. Basis of Measurement: Each, unless otherwise noted in the Plans or if a portion of an assembly.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), vault or manhole for access, air valve assembly, connection to main, connecting internal piping, isolation valves and valves associated with accessories, drain piping as indicated in the Plans, fill as indicated in the plans, compaction ,cleanup and restoration, testing, and all related items.

F. Line Stopping Assemblies:

1. Basis of Measurement: Each, unless otherwise noted in the Plans or if a portion of an assembly.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), preparation of pipe at the location to be stopped off, and the installation of a temporary line stopping assembly in accordance with the manufacturer's recommendations. Also includes a concrete line stop support (with pipe wrapped with visqueen or polywrap) according to the manufacturer's requirements, but with minimum dimensions of 2 feet from both ends and sides of the assembly and a depth from the spring line to 2 feet below the main.

1.04 SUBMITTALS

A. SECTION 01 33 00 – Submittal Procedures.

B. Shop Drawing:

1. Installation Plan: Submit description of proposed installation.

C. Design Data: Submit manufacturer's latest published literature include illustrations, installation instructions, maintenance instructions and parts lists.

D. Manufacturer's Certificates: Submit Statement of Compliance and supporting data, from material suppliers stating that equipment and accessories provided meet or exceed AWWA Standards, NSF 61 certification, and specification requirements.

E. For Pilot-Operated Control Valves, provide schematic for pilot system operation.

F. For Insertion Valves or Line Stopping Assemblies, provide proposed procedures.

1.05 CLOSEOUT SUBMITTALS

A. SECTION 01 70 00 – Execution & Closeout Requirements.

B. Project Record Documents: Record actual locations of valves and appurtenances.

C. Provide Operation and Maintenance Data for equipment indicating materials of construction, recommended maintenance activities and intervals, procedures for adjustments and troubleshooting, and sources for procurement of replacement parts.

D. For Pilot-Operated Control Valves, provide certification from manufacturer certifying installation of equipment in accordance with manufacturer's recommendations.

E. Where the Plans or Special Provisions require such, provide spare parts and maintenance materials to OWNER.

1.06 QUALITY ASSURANCE

A. All Products for use in potable water systems shall be NSF 61 certified.

1.07 QUALIFICATIONS

A. Manufacturer:

1. Utilize equipment and materials from OWNER's standard list of acceptable manufacturers provided in the Special Provisions. If no such list is provided, utilize equipment and materials from list of acceptable manufacturers provided in these specifications.

2. Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE AND HANDLING

A. SECTION 01 60 00 – Product Requirements.

B. Prepare valves and accessories for shipment according to AWWA Standards and seal valve ends to prevent entry of foreign matter into product body.

C. Store products in accordance with manufacturer's written recommendations and instructions, and in areas protected from weather, moisture, or possible damage; do not store products directly on ground.

D. Handle products in accordance with manufacturer's written recommendations and instructions, and in such a manner as to prevent damage to interior or exterior mechanisms and surfaces.

1.09 ENVIRONMENTAL REQUIREMENTS

A. SECTION 01 60 00 – Product Requirements.

B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 - PRODUCTS

2.01 BASIC PROVISIONS FOR GATE, PLUG, BUTTERFLY, AND CHECK VALVES

A. End Connections: Mechanical joint, flanged, or wafer type as indicated in the Plans. If no such indication is provided, utilize mechanical joint for buried applications and flanged joints for exposed applications. Mechanical joints shall conform to AWWA C111 and shall be provided with retainer gland devices. Flanged joints shall conform to AWWA C115 ANSI B16.1 CL 150 unless noted otherwise and shall be provided with 316 stainless steel nuts and bolts.

B. Valve operators:

1. Provide gate, plug, and butterfly valves with open-left (counterclockwise) operation.

2. Provide gate valves with non-rising stems unless specifically stated otherwise in the plans.

3. Provide with 2-inch square operating nut for buried applications.

4. Provide with handwheel operator for exposed applications with manual opening, or 2-inch square operating nut where electric or pneumatic actuator is utilized.

5. Provide side-mounted right-angle gear reducer on plug and butterfly valves 6-inch and larger, and on gate valves 16 inch and larger.

C. Coatings:

1. Provide fusion-bonded epoxy coating conforming to AWWA C116 on all valves for buried applications.

2. Provide coating in accordance with manufacturer's recommendations on all valves for exposed applications where this section is included. If section is not included provide bituminous coating.

3. Provide flow direction arrow on all plug and check valves.

2.02 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:

1. Stainless steel, full circumferential gasket, flanged outlet.

2. Manufacturers:

a. Mueller.

b. JCM Industries

c. Ford Meter Box Co.

d. Substitutions: SECTION 01 60 00 – Product Requirements.

3. Outlet Flange Dimensions and Drilling: AWWA C207 Class D, ANSI 150lb. drilling and MSS SP-60.

B. Tapping Valves:

1. AWWA C515, resilient wedge with non-rising stem. Epoxy coated ductile iron body. Inlet flanges shall conform to ANSI B16.1, Class 150 and MSS SP-60. Mechanical joint outlets shall conform to AWWA C111.

2. Manufacturers:

a. Mueller

b. M and H

c. American Flow Control

d. Substitutions: SECTION 01 60 00 – Product Requirements.

2.01 RUBBER SEATED BUTTERFLY VALVES

A. Manufacturers:

1. Dezurik

2. Pratt

3. Valmatic

4. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Valve body and disc constructed of ASTM A 536 cast iron (Grade 65-45-12). Valve disc shall be of the solid type.

C. Valve shaft constructed of ASTM A 276 Type 304 stainless steel.

D. Resilient seat constructed of Buna-N mated to Type 316 stainless steel body seat ring. Resilient seat shall be located on the valve disc and shall provide a continuous, uninterrupted seating surface.

E. All retaining hardware constructed of Type 316 stainless steel.

F. 150 psi maximum working pressure rating unless stated otherwise in the plans.

2.02 RESILIENT WEDGE GATE VALVES

A. Manufacturers:

1. Mueller

2. M and H Valve Co.

3. American Flow Control

4. Flomatic

5. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Resilient Wedge Gate Valves: AWWA C515; ductile iron wedge and body.

1. Resilient seats.

2. Stem: Non-rising bronze stem.

3. Wedge: Ductile iron, completely encapsulated with resilient material.

4. All internal parts shall be accessible without removing the body from the line.

5. 250 psig maximum working pressure rating standard or 350 psi maximum working pressure rating where indicated on the plans.

2.03 ECCENTRIC PLUG VALVES

A. Manufacturers:

1. DeZurik

2. Mueller

3. Pratt

4. Flomatic

5. VSI (Pending AIS Requirements)

6. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Solid, one-piece plug constructed of cast iron conforming to ASTM A 126 Class B or ductile iron conforming to ASTM 536 Grade 65-45-12.

C. Cast iron body conforming to ASTM A 126 Class B with rectangular port. Permanently lubricated sleeve-type bearings constructed of Type 316 stainless steel.

D. Maximum working pressure rating of at least 175 psi for 12-inch and smaller valves, at least 150 psi for larger valves.

2.04 SWING CHECK VALVES

A. Manufacturers:

1. Dezurik

2. M and H Valve

3. Mueller

4. Pratt

5. Flomatic

6. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Body, disc, and disc arm constructed of ASTM A 536 ductile iron (65-45-12).

C. Shaft shall be a single piece, constructed of Type 304 stainless steel.

D. Valve to be of single disc type with full flow passage.

E. Valve to be supplied with lever and weight unless plans require oil or air cushioning device.

F. Valve to have bolted removable cover for cleaning and maintenance.

G. 200 psi maximum working pressure rating for 3-inch through 12-inch valves, 150 psi for valves larger than 12-inch, unless noted otherwise in the plans.

2.05 SILENT CHECK VALVES

A. Manufacturers:

1. Dezurik

2. Pratt

3. Val-Matic

4. Flomatic

5. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Valve body constructed of ASTM A536 ductile iron (65-45-12).

C. Valve to incorporate a center guided, spring loaded disc, guided at opposite ends and having a short linear stroke that generates a flow area equal to pipe size.

D. Seat and disc to be cast bronze or aluminum bronze. Compression spring to be Type 316 stainless steel.

E. Valve to have a replaceable guide bushing held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi.

F. Valve disc to be concave to the flow direction.

G. Leakage rate not to exceed one-half the allowable rate for metal seated valves under AWWA C508 or 0.5 oz per hour per inch of valve diameter.

H. 250 psi maximum working pressure rating unless noted otherwise in the plans.

2.06 INSERTION VALVES

A. Manufacturers:

1. TEAM Industrial Services

2. Advanced Valve Technologies

3. Hydra-Stop

4. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Valve body constructed of ASTM A536 ductile iron (65-45-12).

C. Hardware: 304 Stainless Steel

D. Seat and disc to be cast bronze or aluminum bronze. Compression spring to be Type 316 stainless steel.

E. Valve to have a replaceable guide bushing held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi.

F. Leakage rate not to exceed one-half the allowable rate for metal seated valves under AWWA C508 or 0.5 oz per hour per inch of valve diameter.

G. 250 psi maximum working pressure rating unless noted otherwise in the plans.

2.07 AIR/VACUUM AND AIR RELEASE VALVES

A. Manufacturers:

1. ARI, Inc

2. APCO Valve and Primer Company

3. Crispin Valve

4. Valmatic Valve Co.

5. Bermad

6. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Air release and air/vacuum valves shall be specifically designed by the manufacturer for either clean water service (in the case of finished potable water or other non-solids bearing water systems) or sewage service (in the case of sewerage or other potentially solids bearing systems such as raw water service) as indicated in the plans.

C. Provide air/vacuum valves, air release valves, or combination air valves having the following functionality as indicated in the plans:

1. Air/Vacuum Valves shall open to exhaust large volumes of air in situations such as pipeline filling and shall also open to admit air for the purpose of relieving internal vacuum conditions in situations such as pipeline draining.

2. Air Release Valves shall open to exhaust small pockets of air while the pipeline is operating under pressure.

3. Combination Air Valves shall have the functionality of both air/vacuum valves and air release valves and may be of either the single body or dual body configured.

D. Design Requirements:

1. Provide Air Release and Combination Air Valves with minimum 5/16-inch orifice for exhausting small pockets of air while pipeline is operating under pressure.

2. Provide all air valves and all related accessories with pressure ratings equal to or greater than the maximum pipeline working pressure at the location of the air valve installation.

3. Provide all air valves with low pressure sealing capability equal to or less than 2 psi or, where specifically indicated in the plans, equal to or less than 1 psi.

E. End Connections:

1. 2-inch and smaller valves: Threaded end connections

2. Valves larger than 2-inch: Flanged end connections conforming to ANSI B 16.1 CL 125 unless otherwise indicated in the plans.

F. Accessories: Provide the following accessories with each assembly:

1. For clean water service applications:

a. Provide inflow preventing device which prevents entry of external water into the pipeline system through the air inlet / outlet. Device shall allow the entry or exit of air while preventing entry of water.

b. Provide shut-off valve on the inlet side of the valve which allows isolation of the air valve from the pipeline system. Valve shall have the same or greater pressure rating as the pipeline system.

c. Utilize bronze ball valves with end connections compatible with air valve inlet connection for 2-inch and smaller air valves.

d. Utilize gate valve with end connections compatible with air valve inlet connection for air valves larger than 2 inches.

2. For sewage service applications:

a. Provide backflushing accessories as follows:

b. Blow-off / drain connection and shut-off valve.

c. Clean water supply connection and shut-off valve.

d. Backwash supply hose with quick disconnect.

e. All shut-off valves shall be bronze, full-ported ball valves.

f. Provide shut-off valve on the inlet side of the valve which allows isolation of the air valve from the pipeline system. Valve shall have the same or greater pressure rating as the pipeline system.

g. Utilize bronze ball valves with end connections compatible with air valve inlet connection for 2-inch and smaller air valves.

h. Utilize gate valve with end connections compatible with air valve inlet connection for air valves larger than 2 inches.

2.02 PILOT OPERATED CONTROL VALVES

A. Manufacturers:

1. Bermad

2. Cla-Val

3. Watts

4. Flomatic

5. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Globe or angle pattern as indicated in the plans with ductile iron body and cover conforming to ASTM A 536. Provide with NSF 61 listed fusion bonded epoxy coating and interior lining. Studs and cover nuts shall be 316 stainless steel.

C. Stainless steel throttling components.

D. All trim shall be stainless steel.

E. Disc and diaphragm assembly shall contain a BUNA-N synthetic rubber seal securely retained on 3-1/2 sides by a disc retainer and disc guide.

F. End Connections:

1. For main valves larger than 2-inch, provide flanged end connections conforming to ASTM C115 ANSI B16.1 CL 125 unless otherwise indicated in the plans.

2. For main valves 2-inch and smaller, threaded end connections may be utilized if approved by the ENGINEER.

G. Pilot system:

1. Regulators, fittings, and valves shall be constructed of stainless steel. Pilot system tubing shall be constructed of braided, flexible stainless-steel tubing. All components of the pilot system shall have a working pressure rating in excess of the anticipated pressure conditions shown on the plans.

2. Operation range suitable for the pressure range indicated in the plans.

3. Provide with an external Y-strainer, adjustable opening and closing speed components, and ball-type isolation cock valves.

4. All wetted surfaces contacted by consumable water shall contain less than 0.25% lead by weight.

5. Pilot system manufactured and assembled by the same company as the main valve.

H. Accessories:

1. Provide brass or stainless-steel engraved nameplate for each control valve and associated pilot securely affixed to the associated component. Nameplate shall indicate the following information as applicable:

   a. Catalog and serial number

   b. Function, size, material, and pressure rating

   c. Type of pilot control system used and control adjustment range

2. Where indicated in the plans, provide valve position indicating post.

3. Where indicated in the plans, provide pressure gauges as follows:

   a. 4-inch diameter, glycerin-filled stainless steel with the pressure measurement range as indicated in the plans.

   b. Provide with threaded connections and stainless-steel connecting tubing and fittings.

   c. Minimum of ½" diameter tap size or larger where indicated in the plans.

   d. Provide with quarter-turn ball shut-off valves.

   e. Provide with pulsation damper where indicated in the plans.

4. Where indicated in the plans, provide main-line strainer:

   a. Provide the same size as the control valve and installed immediately upstream from the control valve.

b. Ductile iron body with epoxy coating matching that of the control valve body.

c. Flanged end connections sized to match those of the associated control valve.

d. Incorporate stainless steel screen which is removable for replacement or maintenance without removing the strainer body.

e. NSF-61 certified.

f. Assembly rated for the same working pressure as the control valve.

g. Where indicated in the plans, provide accessories, trim, and configuration which reduces internal cavitation.

h. Where required for valve function, provide solenoids suitable for operation on 120V single-phase AC power, with NEMA IV enclosure and manual operator unless indicated otherwise in the plans.

I. Control Valve Operations and Functionality:

1. Control valves of the following types shall function through a pilot control system as follows:

a. Pressure Reducing Valves – Automatically reduce a varying upstream pressure to an operator-adjustable constant downstream pressure set point, regardless of flow rate. A decrease in downstream pressure shall cause the main valve to increase its opening, thereby increasing the downstream pressure toward the set point. An increase in downstream pressure shall cause the main valve to decrease its opening, thereby decreasing the downstream pressure toward the set point. Where specifically indicated in the plans, provide an internal check feature which prevents flow from downstream to upstream via the pilot control system.

b. Pressure Relief Valves – Remain closed while upstream pressure is below an operator-adjustable set point. Open to exhaust water and relieve pressure when upstream pressure exceeds the set point.

c. Surge Anticipator Valves – Automatically open a pre-set amount upon upstream pressure falling below an operator adjustable set point in anticipation of oncoming surge. Automatically close upon pressure rising above set point.

d. Pressure Sustaining Valves – Automatically maintain upstream pressure at an operator-adjustable set point with varying downstream pressure, regardless of flow rate. A decrease in upstream pressure shall cause the main valve to decrease its opening, thereby decreasing the flow rate and increasing upstream pressure toward the set point. An increase in upstream pressure shall cause the main valve to increase its opening, thereby increasing the flow rate and decreasing the upstream pressure toward the set point.

e. Single Acting Altitude Valves – Remain fully open until the water level in a downstream reservoir or tank reaches an operator-adjustable level setpoint, then close fully. Upon the water level in the downstream tank or reservoir falling a pre-set distance, re-open fully. This valve shall be designed for one-way flow only.

f. Double Acting Altitude Valve – Remain fully open until the water level in a downstream reservoir or tank reaches an operator-adjustable level set point, then close fully. Upon either pressure on the upstream side falling below an operator-adjustable set point, or, the water level in the downstream reservoir or tank falling a pre-set distance, re-open fully. This valve shall be designed for two-way flow.

g. Solenoid-Controlled Open / Close Valve – Either open or close pilot system in response to a changing electrical current to the solenoid, which in turn either opens or closes the main valve. Solenoid shall be either normally open (open upon loss of electrical signal) or normally closed (close upon loss of electrical signal) as indicated in the plans.

h. Solenoid-Controlled Booster Pump Control Valve – Pump operation shall begin with the control valve closed. Upon pump start-up, simultaneously energize solenoid and begin opening the main valve slowly, as controlled by the opening speed control. Upon signal to shut-down pump, maintain the pump running, de-energize the solenoid, and begin slowly closing the main valve, as controlled by the closing speed control. Upon main valve reaching the fully-closed position, a limit switch shall release a valve / pump interlock, and the pump shall shut down. Where indicated in the plans an internal check feature shall be provided to prevent reverse flow.

i. Solenoid-Controlled Deep Well Pump Control Valve – Pump operation shall begin with the valve open. Upon pump start-up, simultaneously energize solenoid and begin closing the main valve slowly, as controlled by the closing pump speed control. Upon signal to shut down the pump or upon loss of power, the solenoid is de-energized, and the main valve begins to open slowly, as controlled by the opening speed control. Upon the main valve reaching the fully open position,

2.02 LINE STOPPING ASSEMBLIES

A. Manufacturers:

1. JCM Industries

2. Substitutions: SECTION 01 60 00 – Product Requirements.

B. Blind Flange: 150 lb, ASTM A36 Carbon Steel, Epoxy Coated.

C. Blind Flange Gasket: Styrene-Butadiene Rubber (SBR) compounded for use with water.

D. Gasket: Nitrile Butadiene Rubber (NBR, Buna-N) per ASTM D2000

E. Bolts and Hardware: Stainless Steel 18-8 Type 304

F. Finish: Fusion applied Epoxy Coating per ANSI/AWWA C213 Standard

2.03 ACCESSORIES

A. Valve Boxes for Buried Valves:

1. 12-inch diameter valves and smaller: Domestic cast iron, two-piece, screw type for height adjustment.

2. Valves larger than 12-inch: Domestic cast iron, three-piece, screw type for height adjustment.

3. For either size condition, provide 6-inch ductile iron pipe riser sections as required for additional height where standard is insufficient.

4. Provide with cast iron lid marked "Water" or "Sewer" as applicable.

B. Valve Markers for Buried Valves:

1. Provide fiberglass marker (either round or flat) or concrete monument as required in the plans. If no such indication is present, provide flat fiberglass marker.

2. For fiberglass markers, provide either blue color for potable water or green color for sewer. Provide with OWNER's standard labeling information as indicated in the plans or specifications. If no such information is present, provide minimum labeling as follows:

a. "Warning – Water (Sewer) Pipeline Below"

b. Notification to contact 811 service before digging

c. OWNER's emergency contact information.

3. For concrete markers, provide dimensions as indicated in the plans. Provide with markings as shown in the plans. If no such information is present, provide minimum information as follows:

a. "Water (Sewer) Valve

C. Valve Operating Nut Stem Extensions:

1. For buried valves where the valve operating nut is greater than 48-inches below the top of the valve box, provide a stainless-steel stem extension designed to fit snugly and securely onto operating nut and with 2-inch square top operating nut designed to fit into standard valve wrench. Provide length as required so that top of operating nut is between 12 and 36 inches below the top of the valve box.

2. For non-buried valves, provide stainless steel stem extensions and appropriate mounting brackets / guides where indicated in the plans. For applications where

electric or pneumatic actuators are utilized, extensions shall be suitably sized to withstand torque imparted by actuator.

D. Post Type Position Indicators:

1. Manufacturers:

a. Mueller

b. M and H Valve

c. American Flow Control

d. Substitutions: SECTION 01 60 00 – Product Requirements.

2. Vertical Indicator Post designed to operate a non-rising stem gate valve with above ground visual indication of valve position (open or shut).

3. Indicator post shall feature a telescoping stem that can be adjusted to its final position without field cutting of the stem.

PART 3 – EXECUTION

3.01 EXAMINATION

A. SECTION 01 30 00 – Administrative Requirements.

B. Determine exact location, configuration, features, and size of valves and accessories from the Plans; obtain clarification and directions from ENGINEER prior to execution of work.

C. Verify invert elevations of existing work prior to excavation and installation.

3.02 PREPARATION

A. Identify required lines, levels, contours and datum locations.

B. Locate, identify, and protect utilities to remain from damage.

C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.

3.03 INSTALLATION

A. Install all equipment in accordance with the manufacturer's instructions.

3.04 EQUIPMENT START-UP AND COMMISSIONING

A. For pilot-operated control valves, provide on-site services of a manufacturer-certified start- up technician to initially establish set points prior to start-up and make adjustments to equipment as necessary following initial start-up. Start-up technician shall instruct OWNER's staff on operation, maintenance and adjustments of equipment. Services shall be provided for a minimum of 8 hours on-site per control valve, and additionally as necessary if there are difficulties associated with the start-up, at no additional cost to the OWNER.

3.05 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Contract Documents.

END OF SECTION

SECTION 33 01 30
PUMPING AND BYPASSING

PART 1 – GENERAL

1.01 SCOPE

A. CONTRACTOR is required to furnish all materials, labor, equipment, power, maintenance, etc. to implement a temporary pumping system for the purpose of diverting the existing flow around the work area for the duration of the Project.

B. The design, installation, and operation of the temporary bypass pumping system shall be the CONTRACTOR's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

C. When directed by ENGINEER, the CONTRACTOR shall put the affected sanitary sewer line back into service at the end of each working day.

D. All unmanned bypass pumping operations shall be fitted with an auto-dialer feature to monitor the operation of the pump and notify the CONTRACTOR in the event of a pump failure or overflow situation.

1.02 SUBMITTALS

A. Conform to the requirements of SECTION 01 33 00 – Submittal Procedures

B. The following additional items shall be submitted for approval in accordance with SECTION 01 33 00:

1. Detailed Bypass Pumping Plan: CONTRACTOR shall submit to ENGINEER detailed design plans and descriptions outlining all provisions and precautions to be taken by the CONTRACTOR regarding the handling of existing wastewater flows. The pumping system must be designed to provide adequate capacity for peak flows.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used must be constructed to allow dry running for long periods of time to account for the cyclical nature of effluent flows.

B. CONTRACTOR shall provide the necessary stop/start controls for each pump.

C. CONTRACTOR shall include one stand-by pump for each size to be maintained on site. Back-up pumps shall be on-line, isolated from the primary system by a valve.

D. Discharge and suction piping sizing shall be determined according to flow calculations and system operating calculations.

E. High Density Polyethylene (HDPE) – Piping shall be homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, or other deleterious faults. Pipe shall be assembled and joined on site using couplings, flanges or butt-fusion method to provide leak proof joint. Thread or solvent joints are not acceptable. Pipe fusion shall be carried out by personnel certified as fusion technicians by manufacturers of HDPE pipe and/or fusing equipment. Butt-fusion joints shall be true alignment and uniform roll-back beads resulting from use of proper temperature and pressure.

F. Flexible Hoses and Associated Couplings and Connectors – Flexible hose and couplings shall be abrasive resistant and suitable for the intended services (i.e., fire hoses are not permitted). They shall be rated for external and internal loads anticipated including test pressure. External load design shall incorporate anticipated traffic loadings, including traffic impact loading where applicable. When subjected to traffic loading, the system shall be composed of traffic ramps and covers maintaining a H-20 loading requirement while in use or as directed by ENGINEER.

G. Temporary pipe supports and anchoring are required for all piping. All rigid or hard piping shall be constructed with positive restrained joints.

H. Under no circumstance will aluminum irrigation type piping or glued PVC pipe be allowed.

2.02 DESIGN REQUIREMENTS

A. Bypass pumping systems shall have sufficient capacity to pump the peak flow required. The CONTRACTOR shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be repaired. Bypass pumping system may be required to be operated 24 hours a day. CONTRACTOR shall provide all necessary monitoring devices to notify the CONTRACTOR of any pump failure.

B. The CONTRACTOR shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each pump size utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.

C. Bypass pumping system shall be capable of bypassing flow around the Work area and of releasing any amount of flow up to the full available flow into the work area as necessary for satisfactory performance of the Work.

D. The CONTRACTOR shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. The system must overcome any existing force main pressure on discharge.

2.03 PERFORMANCE REQUIREMENTS

A. It is essential to the operation of the existing sewerage system that there be no interruption in the flow of sewage throughout the duration of the project. To this end, the CONTRACTOR shall provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the sewage flow before it reaches the point where it would interfere with work, carry it past the work area, and return it to the existing sewer downstream of the work area.

B. The design, installation, and operation of the temporary pumping system shall be the CONTRACTOR's responsibility. The bypass system shall meet the requirements of all local, State, and Federal codes and regulations.

C. CONTRACTOR shall provide all necessary means to safely convey the sewage past the work area. The CONTRACTOR will not be permitted to stop or impede the main flows under any circumstances.

D. The CONTRACTOR shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers, and that will protect public and private property from damage and flooding.

E. The CONTRACTOR shall protect water resources, wetlands, and other natural resources.

PART 3 – EXECUTION

3.01 PREPARATION

A. Test – CONTRACTOR shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The ENGINEER will be given 24 hours notice prior to testing.

B. Inspection – CONTRACTOR shall inspect bypass pumping system every two hours to ensure that the system is working properly.

C. Inspection – All unmanned bypass pumping operations fitted with an auto-dialer feature to monitor the operation of the pumping system shall test the auto-dialers every day and confirm its completely operational and is to the satisfaction of the ENGINEER.

D. Maintenance Service – CONTRACTOR shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pump(s) is operating.

E. Extra Materials:

1. Spare parts for pumps and piping shall be kept on site as required.

2. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

3.02 PREPARATION

A. Precautions

1. CONTRACTOR is responsible for locating any existing utilities in the area the CONTRACTOR selects to locate the bypass pipelines. The CONTRACTOR shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from ENGINEER. All costs associated with relocating utilities and obtaining approvals shall be the responsibility of the CONTRACTOR.

2. During all bypass pumping operation, the CONTRACTOR shall protect the pumping station and main and all local sewer lines from damage inflicted by any equipment. The CONTRACTOR shall be responsible for any physical damage to the pump station and main and all local sewer lines caused by human or mechanical failure.

3.03 INSTALLATION AND REMOVAL

A. CONTRACTOR shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures only at the access location indicated on the Drawings or as approved by the ENGINEER and as may be required to provide suction conduit.

B. Plugging or blocking of sewage flows shall incorporate primary and secondary plugging devices. When plugging or blocking is no longer needed for performance and acceptance of Work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging, or causing other major disturbances downstream.

C. When working inside a manhole or sewer main, the CONTRACTOR shall exercise caution and comply with OSHA requirements for working in the presence of sewer gases, combustible oxygen-deficient atmospheres, and confined spaces.

D. The installation of bypass pipelines is prohibited in all saltmarsh/wetland areas. The pipeline must be located off streets, sidewalks, and shoulders of the roads. When the bypass pipeline crosses local streets and private driveways, where roadway ramps cannot be used, the CONTRACTOR must place the bypass line in trenches and cover with temporary pavement.

E. Upon completion of the bypass pumping operations, and after the receipt of written permission from the ENGINEER, the CONTRACTOR shall remove all piping, restore all property to pre-construction condition, and restore all pavement and roadways. The CONTRACTOR is responsible for obtaining any approvals for placement of temporary pipelines from local agencies.

END OF SECTION

SECTION 33 01 31
CLOSED-CIRCUIT TELEVISION INSPECTION
OF SEWER PIPELINES

PART 1 – GENERAL

1.01 SCOPE

A. The Work covered by this section includes furnishing all labor, equipment, insurance, transportation, and materials required to inspect the designated sanitary sewer lines specified.

B. Closed-circuit television inspection of sanitary sewers as follows:

1. CCTV inspection for condition assessment of line segments shall identify structural defects, pipe physical condition, sources of I/I entry, lateral location, and visual assessment of laterals from the view of the camera in the mainline.

2. CONTRACTOR shall use the Television Inspection Form approved by ENGINEER prior to the beginning of the inspection.

C. The CONTRACTOR will provide certification that they have undergone training prior to undertaking internal condition assessment work for ENGINEER. Defects Coding, as well as Material, Shape, and Lining Coding used throughout the project, will conform to PACP, or equivalent approved by ENGINEER.

D. The CONTRACTOR will provide sufficient survey/inspection units and all relevant ancillary equipment, including standby units, in the event of a breakdown in order to complete all sewer and manhole surveys/inspections as specified.

E. Flow Control shall be incidental to the CCTV inspection.

F. Traffic Control shall be incidental to the CCTV inspection.

1.02 SUBMITTALS

A. Informational Submittals:

1. Catalog and manufacturer's data sheets for television equipment.

2. References: Contact names and telephone numbers.

3. List of staff and equipment to be used on Project.

4. Crew chief qualifications.

5. Certification that staff to be used for the Work is properly trained in confined space entry and hazardous atmospheres.

6. Proposed defect-coding scheme for ENGINEER approval.

B. Operational Submittals:

1. Traffic control plan. Traffic control plans should be submitted and approved for the entire project prior to beginning work. The plans must be stamped by a registered professional engineer in the State of Alabama.

2. Look-ahead inspection schedules, a minimum of 7 days in advance of the Work.

3. Initial first days' CCTV digital videos and inspection logs on DVD within 24 hours of the start of CCTV inspection.

4. Final report including defect coding information in Microsoft Excel or other format approved by ENGINEER. A sample of the final report format and associated database format shall be submitted for ENGINEER'S approval within 30 days of the notice to proceed.

5. CCTV digital video shall be submitted in a format compatible with Windows Media Player. Viewing digital videos shall not require special software. ENGINEER will provide video format for submission: WMV 7, WMV 8, MPEG, mp4, or approved equal.

6. CONTRACTOR shall note Pipe ID in the database. The Pipe ID will be provided by ENGINEER and will coincide with the provided upstream and downstream manhole.

C. Any submittal requirement may be waived at the discretion of the engineer of record.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. CONTRACTOR: Performed work successfully for at least three other projects, within last 5 years, with pipe lengths and pipe diameters similar to this Project.

2. Crew Chief: Minimum of 5 years' experience on projects similar to this Project and experience using proposed equipment for this Project.

B. Pre-startup Meeting: At least 5 days prior to beginning CCTV inspection work, schedule with ENGINEER to review proposed sewer flow bypassing plan, traffic control plans, and inspection methods.

C. Submit digital videos, photos, and logs for quality review and comment to ENGINEER within 24 hours after the first days' work is completed. Submit DVD's and logs on a routine basis within 7 days after completing each DVD. Picture quality and definition shall be to the satisfaction of the ENGINEER. Inspection equipment that fails to produce satisfactory inspection quality shall be removed.

1.04 NOTIFICATIONS

A. Notify ENGINEER:

1. A minimum of 5 days prior to the anticipated commencement of inspections in any one area and 24 hours in advance of actual start.

2. When obstruction, restricting flow in the pipeline, is discovered.

3. If the depth of flow in the pipeline exceeds 33 percent of the pipe diameter.

4. If conditions for CCTV inspection are found to be unsafe or impractical.

5. Pipe configuration in the field is different than shown on maps. The notification shall include a diagram clearly indicating the location of structures in relation to immediately adjacent structures, along with pipe size, material, and diameter.

6. Complete and submit map correction sheets provided by ENGINEER when map discrepancies are identified.

PART 2 – PRODUCTS

2.01 TELEVISION INSPECTION EQUIPMENT

A. CONTRACTOR shall provide a mobile vehicle with video monitoring equipment specifically compatible with the camera equipment being used. The equipment shall include dual video recorders, dual monitors, and picture capture capability. The vehicle shall be large enough to accommodate at least three people at any time for viewing of the monitor. ENGINEER shall have unrestricted access to observe the television screen and all other operations at all times. There shall be no smoking in the vehicle.

B. The basic equipment for use in cleaning and inspection operations shall consist of hydraulically propelled or mechanical cleaning equipment and a self-propelled full-color television inspection camera with footage meter, pan, and tilt functions.

C. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear color picture of the entire periphery of the pipe. The camera shall be capable of a 360-degree viewing area. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 500-line resolution picture. Backup camera shall be available on the Project Site. The camera shall be operational in 100 percent humidity conditions. Camera shall be operational in a hazardous and corrosive environment.

D. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the ENGINEER.

E. The television inspection equipment shall have an accurate footage counter that shall display on the monitor the exact distance of the camera from the centerline of the starting manhole.

F. For off-road areas containing pipe to be inspected, portable cameras will be allowed as approved by ENGINEER. Portable cameras should only be used for areas typical TV trucks are unable to reach.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prior to televising, CONTRACTOR shall thoroughly clean the pipelines of debris, grease, roots, sediment, broken pipe or other obstructions that could retard the movement of the television camera. Precautions shall be taken to protect the sewer lines being cleaned from damage by the cleaning equipment. Any solids or semisolids resulting from the cleaning operations shall be removed from the site and deposed of legally.

B. The CONTRACTOR shall anticipate a minimum of one pass with the jet washing equipment in each pipeline segment (from manhole to manhole) prior to inserting CCTV camera and transporter. The CONTRACTOR shall then operate the cleaning/cutting tool in tandem with the camera equipment so that residual roots and debris may be cleaned. Roots must be removed with cutting tools approved by the ENGINEER prior to initiating work. The CONTRACTOR will not be responsible for cutting any protruding laterals.

C. Immediately after cleaning, the sewer line section shall be visually inspected by means of closed-circuit television to determine the condition of the line. The inspection will be done one pipe section at a time (i.e. manhole to manhole), and the flow in the section being inspected will be suitably controlled as specified.

D. All internal pipe damage shall be photographed in color by CONTRACTOR utilizing picture capture equipment. The photograph shall be clearly labeled with the upstream and downstream manhole ID numbers, footage, and type of defect. The upstream and downstream manholes shall always be referenced in the downstream direction regardless of the direction the camera traveled. The photographs shall be the property of ENGINEER.

3.02 TELEVISION INSPECTION

A. Information to be recorded during the inspection shall include the following:

1. pipe size and material (including change in pipe size and material)

2. location (footage) and severity of defects, including cracks, broken pipe, collapsed pipe, misaligned joints, root intrusion, protruding laterals, sags, corrosion, visible infiltration, and grease.

3. location (footage and quadrant) and type (wye, tee, tap) of lateral connections.

4. For defects extending in a longitudinal direction along the pipe (e.g., longitudinal cracks, sags, corrosion), the starting and ending location of the defect shall be recorded.

5. Inline segments that are found to be free of such defects, electronic photographs of typical sections shall also be taken. The photographs shall be labeled with the ID number (upstream and downstream manholes) of the line segment.

B. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer line section condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cables, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.

C. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to ensure good communications between members of the crew.

D. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of the manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device; the accuracy shall be acceptable to the ENGINEER.

E. The camera height shall be adjusted such that the camera lens is always centered in the pipe being televised.

F. Lighting system shall be adequate for quality pictures. A reflector in front of the camera may be required to enhance lighting in black pipe.

3.03 PASSAGE OF TV CAMERA

A. There may be occasions during the TV inspection of a sewer line section, when the camera will be unable to pass an obstruction even though flow is continuing. CONTRACTOR shall televise the pipe section from the other direction in order to obtain a "full" video of this pipe section. Whenever such a condition arises, ENGINEER shall be notified to determine if a point repair is necessary. No additional payment shall be made for reverse set-ups required due to an obstruction.

B. TV videos shall be submitted in one continuous section from manhole to manhole and not in broken pieces unless specifically approved by ENGINEER.

C. When the camera is being pulled from the "other end" and a second repair location is encountered away from the first repair/obstruction location, the ENGINEER shall be

notified and allowed to review the TV DVD in a timely manner.

D. OWNER makes no guarantee that all of the sanitary sewer mains proposed to be TV inspected after the cleaning are clear for the passage of the camera set-up. The equipment, tools, and method(s) used for securing the passage of the camera are to be at the discretion of the CONTRACTOR, with the approval of the ENGINEER. The decision to repair or not to repair a location shall always be made by ENGINEER.

E. The television camera shall be moved through the line in either direction at a uniform rate, stopping when necessary to ensure proper documentation of the sewer's condition, but in no case shall the television camera travel at a speed greater than 30 feet per minute.

F. The television camera shall travel through the lines using its own power. The pictures taken of the entire inside periphery of the pipe shall be clear and visible. Picture quality and definition shall be to the satisfaction of the ENGINEER, and if unsatisfactory, the equipment shall be removed with no payment made for the unsatisfactory inspection.

G. At all service laterals, the camera shall be stopped and panned to such an angle that an internal view of the service lateral is available to determine if the lateral is active or dead or plugged. Where other pipe deficiencies are noted, the camera shall be stopped to observe the condition, record information, and take photographs. Any service lateral or deficiency observed in the sewer line shall be photographed and described on the photograph.

3.04 DATA REQUIREMENTS

A. No later than fourteen (14) days following the completion of a pipeline survey/inspection, the CONTRACTOR will submit to ENGINEER two (2) hard copies of all details, i.e. typed "Full Detail" report for each inspection, showing the position and full text of each defect encountered and their grades. The CONTRACTOR will also supply an overall Summary report detailing major defects and those inspections that require attention and a statistical report showing lengths of sewers inspected and a breakdown of sizes and lengths inspected. Two (2) DVD's will be submitted to ENGINEER containing the encoded videos, database(s), reports (in PDF format) and databases. The supplied data and information will remain the property of ENGINEER.

B. An example of a typical CCTV survey final deliverable will be submitted for approval by ENGINEER within 30 days of the Notice to Proceed. The example deliverable will contain the proposed viewing software, be shown to be using PACP nomenclature, or equivalent approved by ENGINEER, and be computer validated. The example will be fully crossed referenced to the videos, sonar images, and reports. The example will be presented both in hard copy and on a suitable media (DVD/CD).

C. The CONTRACTOR will supply free-issue software for both the viewing of the media files and the sonar images. Four (4) hours of training in the use of any supplied free issue software will be included in the rates.

3.05 FLOW CONTROL

A. TV inspection shall be done one sewer line section at a time, and the flow in the section being televised shall be suitably controlled. The depth of wastewater flow shall not exceed that shown below:

1. 6" - 10" Pipe: 20% of pipe's diameter

2. 12"- 24" Pipe: 25% of pipe's diameter

B. When the depth of flow in the section being worked is above the maximum allowable for the television inspection, the flow shall be reduced to allowable levels by performing the inspection during minimum flow hours, with diversion pumping, or by pulling the camera with a swab or a high-velocity jet nozzle, as approved by ENGINEER.

C. No separate payment shall be made for sewer flow. Bypass pumping shall be performed per SECTION 01 51 36 – Pump Station Flow Control.

D. CONTRACTOR shall not be allowed to float the camera unless permitted by ENGINEER.

E. When the flow in a sewer line is plugged, blocked, or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

3.06 DOCUMENTATION

A. CONTRACTOR shall submit in electronic format digital videos, photos, and evaluation reports, to ENGINEER for review. ENGINEER'S review and comment period may require up to 30 working days from the date of submittal.

B. The digital video shall be recorded at Standard Play, and each digital video segment information will be entered in a log. The delivery format shall be compatible with Windows Media Player.

C. If digital videos are of such poor quality that ENGINEER is unable to evaluate the condition of the sanitary sewer main, locate the sewer service connections, or verify proper cleaning, CONTRACTOR shall be required to re-televise the sanitary sewer and provide new digital videos of good quality, at no additional cost to ENGINEER.

D. All digital videos will become the property of ENGINEER.

E. Payment deduction of $100 per digital video shall apply for poor and unacceptable quality digital videos or for portions of sewer not televised. Camera distortions, inadequate lighting, dirty lens or blurred/hazy picture will be cause for rejection of the Work.

3.07 EVALUATION REPORTS

A. Each video shall be accompanied by a TV inspection report, which shall be an electronic log of all pipe defects, sags, service connection locations, and conditions, etc., recorded on a footage basis.

B. The size/length of the defect shall be reported. The beginning of all sags of the pipe, the length that is underwater, as well as where the camera pulls out of the sag shall be reported. The clock position of each service connection and the condition shall be reported. The condition of each service connection will include the distance protruding when appropriate and the type.

C. This log shall also identify the section being televised, flow, camera direction, type of pipe, pipe condition, weather conditions, type of surface cover, or any other information required by the ENGINEER.

D. ENGINEER may provide CONTRACTOR a log form for the above-mentioned defects.

E. At the end of the Project, CONTRACTOR shall provide a summary listing of all videos provided under this Project.

3.08 PAYMENT

A. Payment for the work included in this Section is subsidiary to the sewer pipe installation work.

B. ENGINEER will review submittals within thirty days of submittal date.

C. CONTRACTOR can submit request for payment one time per month.

END OF SECTION

SECTION 33 01 32
CLEANING OF DRAINS, SEWERS, AND MANHOLES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes cleaning of sewer pipe and fittings installed and/or rehabilitated, complete as shown on the Drawings and as specified herein.

B. Cleaning includes proper high-pressure water jetting, rodding, bucketing, brushing, and flushing of drains, sewers, and manholes prior to inspection by closed circuit television, pipeline rehabilitation or replacement, point repairs, manhole preparation, and testing operations.

C. Clean all sewers to remove debris, roots, intruding services, deposits, and other blockages to a minimum of 95 percent open. Perform sewer cleaning work to an acceptable level as necessary to perform a thorough television inspection of the sewer. If the pipe condition is such that cleaning may cause a potential collapse, then the pipe shall be televised without attempting to clean it to 95 percent condition, pending approval by ENGINEER.

D. Related Requirements

1. SECTION 33 01 31 – CCTV Inspection of Sewer Pipelines

1.02 DEFINITIONS

A. Light Cleaning: Small amounts of debris existing within the sewer line and where sewer reaches do not require heavy cleaning, as defined below, and that produce little or no debris.

B. Heavy Cleaning: Large deposits of debris or heavy root growth existing within the sewer line and where sewer reaches require debris removal of depths up to 25 percent of pipe height.

C. Excessive Heavy Cleaning: Large deposits of debris or heavy root growth existing within the sewer line and where sewer reaches require debris removal exceeding the definition of Heavy Cleaning, and the time required to clean and inspect the line must be at least twice the average time required to clean and inspect other sewers of comparable length and diameter.

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Light Cleaning

1. Clean sewer using standard industry procedures of high-pressure water jetting equipment or other approved equipment. Costs related to cleaning of such sewers shall be included in CONTRACTOR's unit prices for CCTV and Heavy Cleaning.

2. Basis of Measurement: By linear foot.

3. Basis of Payment: TV inspection, data compiling according to NASSCO PACP standards, and audio-video recording of the pipeline.

B. Heavy cleaning

1. Heavy cleaning must be approved by ENGINEER. Include costs related to cleaning of such sewers in Unit Prices for Heavy Cleaning. Costs related to televising of such sewers following heavy cleaning shall be included in Unit Prices for CCTV and Heavy Cleaning. Compensation for heavy cleaning of a particular line will only be paid if:

   a. Heavy cleaning was authorized by the ENGINEER prior to the performance of the work.

   b. CONTRACTOR proves that both significant time and effort were necessary to clean the line (i.e. time required to clean and inspect the line must be at least twice the average time required to clean and inspect other sewers of comparable length and diameter.

   c. Adequate video proof of 'before' blockage, debris, grit or grease build-up, or other condition is provided.

   d. A submerged camera does not justify a need for heavy cleaning; proof that submergence was due to a blockage or heavy debris and not sag in the line will be required.

2. Heavy Cleaning will be paid for on a lineal foot basis only for the length required to be cleaned, i.e., from the downstream manhole to the approximate location of heavy cleaning. This may or may not include the entire pipe section unless otherwise approved by the ENGINEER or OWNER.

3. Basis of Measurement: By linear foot, measured.

4. Basis of Payment: TV inspection, data compiling according to NASSCO PACP standards, and audio-video recording of the pipeline.

C. Excessive Heavy Cleaning

1. Pipes that contain excessive blockages will be paid on a time and material basis upon approval by ENGINEER. A full-time resident observer is required to oversee time and material work. Provide direct water source as required. ENGINEER or OWNER may determine whether any individual pipe be cleaned on a time and material basis.

1.04 INFORMATIONAL SUBMITTALS

A. Refer to SECTION 01 33 00 - Submittal Procedures.

B. Submit a safety plan prior to performing any on-site work that includes the following as a minimum:

1. Confined Space Entry.

2. Personal Protective Equipment.

C. Qualifications Statements:

1. CONTRACTOR shall have a minimum of five years' experience in sewer line and underground structure cleaning and must submit a list of at least three customers who have had similar work completed by CONTRACTOR. Furnish trained and qualified technicians with proper experience operating equipment that is being used on this project.

1.05 CLOSEOUT PROCEDURES

A. Refer to SECTION 01 77 00 – Closeout Procedures.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION

A. Remove debris, roots, intruding services, deposits, and other blockages to a minimum of 95 percent open as necessary to perform a thorough television inspection of sewer. If pipe condition is such that cleaning may cause a potential collapse, televise pipe without attempting to clean it to 95 percent condition, pending approval by ENGINEER.

B. Select, based on pre-construction CCTV inspection, cleaning equipment to address conditions of manhole and sewer lines at the time the work commences to adequately remove dirt, grease, rocks, sand, and other materials and obstructions from sewer lines and manholes to allow performance of other work.

C. Take satisfactory precautions to protect sewer lines from damage that might be caused by improper use of cleaning equipment. Whenever using hydraulically propelled cleaning tools that depend upon water pressure to provide their cleaning force, or any tools that retard flow of water in sewer line, take precautions to ensure that water does not cause damage or flooding to public or private property.

D. No fire hydrant shall be obstructed in case of a fire in area served by hydrant.

E. Remove water meters, piping, and related equipment from fire hydrants at end of each work day.

3.02 EQUIPMENT

A. Hydraulic Sewer Cleaning Equipment

1. Equipment: movable dam type constructed so that a portion of the dam may be collapsed at any time during cleaning operation to protect against flooding of sewer.

2. Movable dam shall be same diameter as pipe being cleaned and shall provide flexible scraper around outer periphery to ensure total removal of grease. If sewer cleaning balls or other such equipment which cannot be collapsed instantly are used, take special precautions against flooding of sewers and public or private property.

B. High Velocity Jet (Hydrocleaning) Equipment:

1. Have a minimum of 500 feet of high-pressure hose.

2. Have a selection of two or more velocity nozzles that are capable of producing a scouring action from 15 to 45 degrees in all size lines to be cleaned. Also include a high velocity gun for washing and scouring manhole walls and floor.

3. Be capable of producing a minimum of 80 gallons per minute flows from a fine spray to a long-distance solid stream and delivering up to 1000 psi. Be able to carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel. Locate controls so equipment can be operated above ground. Select flowrates and pressures as required for each size of sewer, type of debris, and amount of debris, and as recommended by nozzle manufacturers.

4. Have a water tank, auxiliary engines and pumps, and a hydraulically driven hose reel.

5. Have root cutting blades that are hydraulically spun.

C. Mechanical Cleaning Equipment

1. Bucket machines shall be in pairs and with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe shall not be acceptable.

2. Power rodding machines shall be either sectional or continuous type capable of holding a minimum of 750 feet of rod. Rod shall be specifically treated steel. To ensure safe operation, machine shall have a fully enclosed body and an automatic safety release clutch or relief valve.

3.03 APPLICATION

A. Provide appropriate screening to stop passing of materials into downstream sewers. Sludge, dirt, sand, rocks, grease, and other solid or semisolid residue, debris, and material resulting from cleaning operations shall be removed at downstream manhole of section of sewer being cleaned. Passing material from manhole section to manhole section which could cause line stoppages, accumulations of sand in wet wells, or damage to pumping equipment shall not be permitted.

B. Remove debris, residue, and other materials resulting from cleaning operations from site at end of each workday and shall be disposed of in an approved and lawful manner. Under no circumstances will accumulation of debris, residue, and other matter be permitted on site beyond stated time, unless prior written authorization is given for storage in totally enclosed containers.

C. Flushing of sanitary sewers to facilitate cleaning activities without the capture of solids and debris is expressly prohibited without the written permission of the ENGINEER.

D. Retrieval of equipment lodged in pipes or a wet well is CONTRACTOR's responsibility and shall be performed at CONTRACTOR's expense.

E. Cleaning Precautions: During sewer cleaning operations, satisfactory precautions shall be taken in use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard flow in sewer line are used, precautions shall be taken to ensure that water pressure created does not damage or cause flooding of public or private property being served by sewer. When possible, flow of sewage in sewer shall be utilized to provide necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, water shall be conserved and not used unnecessarily.

F. No sewer cleaning shall take place in a particular sewer segment until upstream pipe segments have been cleaned. If cleaning is done in a downstream pipe segment in order to facilitate overall cleaning operations, segment shall be re-cleaned at no additional cost to OWNER, after pipes upstream of that segment have been cleaned.

G. Sewer line walls shall be cleaned adequately to provide for proper operation of joint testing and sealing equipment or internal inspection to discern structural defects, misalignment and infiltration/inflow sources. Cleaning shall be performed immediately prior to joint testing and sealing and internal inspection to preclude build-up of debris from infiltration/inflow sources and discharges from upstream pipeline sections.

H. Designated sewer manhole sections shall be cleaned using hydraulically propelled, high velocity jet, or mechanically powered equipment. If cleaning of an entire section cannot be successfully performed from one manhole, equipment shall be set up on other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or equipment fails to traverse entire manhole section, it will be assumed that a major blockage exists, and cleaning effort shall be repeated with other types of equipment. Immediately report any blockages to ENGINEER.

I. Water for sewer cleaning shall be provided by the OWNER and obtained at locations in accordance with the OWNER. If water is obtained from a potable supply, provide appropriate backflow prevention devices as required by authority having jurisdiction to protect potable system from cross connections and contamination. Prevent cross contamination of any public or private water systems used for this purpose.

3.04 FIELD QUALITY CONTROL

A. Acceptance of sewer line cleaning is contingent on satisfactory completion of television inspection. If television inspection shows cleaning to be unsatisfactory, re-clean sewer line and re-inspect until cleaning is shown to be satisfactory.

B. If internal joint testing and sealing is to follow cleaning, give particular attention to adequacy of cleaning to ensure that proper seating of sealing packer can be achieved.

C. Inspection of cleaning operations will be made on a daily basis by the ENGINEER.

3.05 FINAL CLEANING

A. Refer to SECTION 01 77 00 – Closeout Procedures.

B. Upon cleaning of underground sewer lines or structures, removal debris from finish grade and clean work areas so conditions at conclusion of the work are equal to or better than areas prior to work of this Section.

END OF SECTION

SECTION 33 05 05
BURIED PIPING INSTALLATION

PART 1 – GENERAL

1.01 SUMMARY

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to install and test all buried piping, fittings, and specials. The Work includes the following:

a. All types and sizes of buried piping, except where buried piping installations are specified under other Sections or other contracts.

b. Unless otherwise shown or specified, this Section includes all buried piping Work required, beginning at the outside face of structures or structure foundations, including piping beneath structures, and extending away from structures.

c. Work on or affecting existing buried piping.

d. Installation of all jointing and gasket materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, cathodic protection, and other Work required for a complete, buried piping installation.

e. Supports, restraints, and thrust blocks.

f. Pipe encasements, with the exception of piping embedded in concrete within a structure or foundation.

g. Field quality control, including testing.

h. Cleaning and disinfecting.

i. Incorporation of valves, meters, and special items shown or specified into piping systems in accordance with the Contract Documents and as required.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before buried piping Work.

2. Coordinate with appropriate piping Sections of Division 40, Process Integration.

C. Related Sections:

1. SECTION 40 05 19 – Ductile Iron pipe.

2. SECTION 40 05 31 – Thermoplastic Process Pipe.

3. SECTION 40 05 39 – Concrete Pipe. (NOT USED)

D. Related Standards:

1. ASTM C924, Practice for Testing Concrete Pipe Sewer Lines by Low- Pressure Test Method.

2. ASTM D2321, Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.

3. ASTM D2774, Practice for Underground Installation of Thermoplastic Pressure Piping.

4. ASTM F1417, Test Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air.

5. ANSI/AWWA C105, Polyethylene Encasement for Ductile-Iron Pipe Systems.

6. ANSI/AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

7. ANSI/AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.

8. ANSI/AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

9. ANSI/AWWA C606, Grooved and Shouldered Joints.

10. ANSI/AWWA C651, Disinfecting Water Mains.

11. AWWA M23, PVC Pipe - Design and Installation.

12. AWWA M41, Ductile-Iron Pipe and Fittings.

13. ASCE 37, Design and Construction of Sanitary and Storm Sewers.

14. American Concrete Pipe Association, Concrete Pipe Handbook.

15. Chlorine Institute, Inc., Piping Systems for Dry Chlorine, Pamphlet No. 6.

16. NFPA 24, Standard for the Installation of Private Fire Service Mains and their Appurtenances.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements and recommendations of authorities having jurisdiction over the Work, including:

a. OWNER's Water & Sewer Department

2. Obtain required permits for Work in roads, rights-of-way, railroads, and other areas of the Work.

1.03 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Laying schedules for concrete pipe and piping with restrained joints.

b. Details of piping, specials, joints, harnessing and thrust blocks, and connections to piping, structures, equipment, and appurtenances.

2. Product Data:

a. Manufacturer's literature and specifications, as applicable, for products specified in this Section.

3. Testing Procedures:

a. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER's approval prior to commencing testing.

B. Informational Submittals: Submit the following:

1. Certificates:

a. Certificate signed by manufacturer of each product certifying that product conforms to applicable referenced standards.

2. Field Quality Control Submittals:

a. Results of each specified field quality control test.

C. Closeout Submittals: Submit the following:

1. Record Documentation:

a. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract

modifications relative to buried piping Work. Submittal shall show actual location of all piping Work and appurtenances at same scale as the Drawings.

b. Show piping with elevations referenced to Project datum and dimensions from permanent structures. For each horizontal bend in piping, include dimensions to at least three permanent structures, when possible. For straight runs of piping provide offset dimensions as required to document piping location.

c. Include profile drawings with buried piping record documents when the Contract Documents include piping profile drawings.

d. Conform to SECTION 01 78 39 – Project Record Documents.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work.

2. Upon delivery inspect pipe and appurtenances for cracking, gouging, chipping, denting, and other damage and immediately remove from Site and replace with acceptable material.

B. Storage:

1. Store materials to allow convenient access for inspection and identification. Store material off ground using pallets, platforms, or other supports. Protect packaged materials from corrosion and deterioration.

2. Pipe and fittings other than PVC and CPVC may be stored outdoors without cover. Cover PVC and CPVC pipe and fittings stored outdoors.

C. Handling:

1. Handle pipe, fittings, specials, and accessories carefully in accordance with pipe manufacturer's recommendations. Do not drop or roll material off trucks. Do not drop, roll or skid piping.

2. Avoid unnecessary handling of pipe.

3. Keep pipe interiors free from dirt and foreign matter.

4. Protect interior linings and exterior coatings of pipe and fittings from damage. Replace pipe and fittings with damaged lining regardless of cause of damage.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Pipe Piping materials are specified in the Contract Drawings.

B. General:

1. Manufacturer shall cast or paint on each length of pipe and each fitting pipe material, diameter, and pressure or thickness class.

2.02 BURIED PIPING IDENTIFICATION

A. Polyethylene Underground Warning Tape for Metallic Pipelines:

1. Tracer tape shall be of inert, acid- and alkali-resistant, polyethylene, four mils thick, six inches wide, suitable for direct burial. Tape shall be capable of stretching to twice its original length.

2. Message shall read, "CAUTION "POTABLE WATER", "SANITARY SEWER", "CHLORINE GAS", or other appropriate service, as indicated in the Contract Drawings and "PIPE BURIED BELOW" with bold letters approximately two inches high. Messages shall be printed at maximum intervals of two feet.

3. Manufacturer: Provide products of one of the following:

a. Brady Corporation

b. Seton Identification Products

c. Marking Services, Inc.

d. Or equal.

B. Detectable Underground Warning Tape for Non-Metallic Pipelines:

1. Tape shall be of inert, acid- and alkali-resistant, polyethylene, five mils thick, six inches wide, with aluminum backing, and have 15,000 psi tensile strength and 80 percent elongation capability. Tape shall be suitable for direct burial.

2. Message shall read, "CAUTION "POTABLE WATER", "SANITARY SEWER", "CHLORINE GAS", or other appropriate service, as indicated in the Contract Drawings "PIPE BURIED BELOW" with bold letters approximately two inches high. Messages shall be printed at maximum intervals of two feet.

3. Manufacturer: Provide products of one of the following:

a. Brady Corporation

b. Seton Identification Products

c. Marking Services, Inc.

d. Or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General:

1. Install piping as shown, specified, and as recommended by pipe and fittings manufacturer.

2. In event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from ENGINEER before proceeding.

3. ENGINEER will observe excavations and bedding prior to laying pipe by CONTRACTOR. Notify ENGINEER in advance of excavating, bedding, pipe laying, and backfilling operations.

4. Minimum cover over buried piping shall be 5 feet, unless otherwise shown or approved by ENGINEER.

5. Earthwork is specified in SECTION 31 23 00 – Earthwork.

6. Excavation in excess of that required or shown, and that is not authorized by ENGINEER shall be filled at CONTRACTOR's expense with drainage fill furnished, placed, and compacted in accordance with SECTION 31 23 00 – Earthwork.

7. Comply with NFPA 24 for "Outside Protection", where applicable to water piping systems used for fire protection.

B. Separation of Sewers and Potable Water Piping:

1. Horizontal Separation:

a. Where possible, existing and proposed potable water mains and service lines, and sanitary, combined, and storm sewers shall be separated horizontally by clear distance of at least ten feet.

b. If local conditions preclude the specified clear horizontal separation, installation will be allowed if potable water main is in separate trench or on undisturbed earth shelf on one side of sewer and with bottom of potable water main at least 18 inches above top of sewer.

c. Exception:

1) Where it is not possible to provide minimum horizontal separation described above, construct potable water main of cement-lined ductile iron pipe with restrained push-on joint or restrained mechanical joint pipe complying with public water supply design standards of authority having jurisdiction. Hydrostatically test water main and sewer as specified in this Section prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.

2. Vertical Separation:

a. Provide minimum vertical distance of 18 inches between outside of potable water main and outside of sewer when sewer crosses over potable water main.

b. Center a section of potable water main pipe at least 17.5 feet long over sewer so that sewer joints are equidistant from potable water main joints.

c. Provide adequate structural support where potable water main crosses under sewer. At minimum, provide compacted select backfill for ten feet on each side of crossing.

d. Exceptions:

1) Where it is not possible to provide minimum vertical separation described above, construct potable water main of cement-lined ductile iron pipe with restrained push-on joint or restrained mechanical joint pipe. Hydrostatically test water main and sewer as specified in this Section, prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.

2) Encase either potable water main or sewer in watertight carrier pipe extending ten feet on each side of crossing, measured perpendicular to potable water main.

C. Plugs:

1. Temporarily plug installed pipe at end of each day of work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe.

2. Install standard plugs in bells at dead ends, tees, and crosses. Cap spigot and plain ends.

3. Fully secure and block plugs, caps, and bulkheads installed for testing to withstand specified test pressure.

4. Where plugging is required for phasing of the Work or subsequent connection of piping, install watertight, permanent type plugs, caps, or bulkhead acceptable to ENGINEER.

D. Bedding Pipe: Bed pipe as specified and in accordance with details on the Drawings.

1. Trench excavation and backfill, and bedding materials shall conform to SECTION 31 23 23 – Trenching and Backfilling, as applicable.

2. Where ENGINEER deems existing bedding material unsuitable, remove and replace existing bedding with approved granular material furnished, placed, and compacted in accordance with SECTION 31 23 23 – Trenching and Backfilling. Payment for additional excavation and providing granular material will be made under the unit price payment items in the Contract.

3. Where pipe is installed in rock excavation, provide minimum of three inches of granular bedding material underneath pipe smaller than four-inch nominal diameter, and minimum of six inches of granular bedding material underneath pipes four-inch nominal diameter and larger.

4. Excavate trenches below bottom of pipe by amount shown and indicated in the Contract Documents. Remove loose and unsuitable material from bottom of trench.

5. Carefully and thoroughly compact pipe bedding with handheld pneumatic compactors.

6. Do not lay pipe until ENGINEER approves bedding condition.

7. Do not bring pipe into position until preceding length of pipe has been bedded and secured in its final position.

E. Laying Pipe:

1. Conform to manufacturer's instructions and requirements of standards and manuals listed below, as applicable:

   a. Ductile Iron Pipe: ANSI/AWWA C600, ANSI/AWWA C105, AWWA M41.

   b. Concrete Pipe: AWWA M9.

   c. Steel Pipe: ANSI/AWWA C206, AWWA M11.

   d. Thermoplastic Pipe: ASTM D2321, ASTM D2774, ANSI/AWWA C605, AWWA M23, AWWA M45, AWWA, M55.

   e. Sanitary and Storm Sewers: ASCE 37.

2. Install pipe accurately to line and grade shown and indicated in the Contract Documents, unless otherwise approved by ENGINEER. Remove and reinstall pipes that are not installed correctly.

3. Slope piping uniformly between elevations shown.

4. Keep groundwater level in trench at least 24 inches below bottom of pipe before laying pipe. Do not lay pipe in water. Maintain dry trench conditions until jointing and

backfilling are complete. Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.

5. Start laying pipe at lowest point and proceed towards higher elevations, unless otherwise approved by ENGINEER.

6. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise approved by ENGINEER.

7. Place concrete pipe containing elliptical reinforcement with minor axis of reinforcement in vertical position.

8. Excavate around joints in bedding and lay pipe so that pipe barrel bears uniformly on trench bottom.

9. Deflections at joints shall not exceed 75 percent of amount allowed by pipe manufacturer, unless otherwise approved by ENGINEER.

10. For PVC and CPVC piping with solvent welded joints, 2.5-nch diameter and smaller, and copper tubing, snake piping in trench to compensate for thermal expansion and contraction.

11. Carefully examine pipe, fittings, valves, and specials for cracks, damage, and other defects while suspended above trench before installation. Immediately remove defective materials from the Site and replace with acceptable products.

12. Inspect interior of all pipe, fittings, valves, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is laid.

13. Field cut pipe, where required, with machine specially designed for cutting the type of pipe being installed. Make cuts carefully, without damage to pipe, coating or lining, and with smooth end at right angles to axis of pipe. Cut ends on push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe.

14. Do not place blocking under pipe, unless specifically approved by ENGINEER for special conditions.

15. Touch up protective coatings in manner satisfactory to ENGINEER prior to backfilling.

16. Notify ENGINEER in advance of backfilling operations.

17. On steep slopes, take measures acceptable to ENGINEER to prevent movement of pipe during installation.

18. Thrust Restraint: Where required, provide thrust restraint conforming to Article 3.3 of this Section.

19. Exercise care to avoid flotation when installing pipe in cast-in-place concrete, and in locations with high groundwater.

F. Jointing Pipe:

1. Ductile Iron Mechanical Joint Pipe:

a. Immediately before making joint, wipe clean the socket, plain end, and adjacent areas. Taper cut ends and file off sharp edges to provide smooth surface.

b. Lubricate plain ends and gasket with soapy water or manufacturer's recommended pipe lubricant, in accordance with ANSI/AWWA C111, just prior to slipping gasket onto plain end of the joint assembly.

c. Place gland on plain end with lip extension toward the plain end, followed by gasket with narrow edge of gasket toward plain end.

d. Insert plain end of pipe into socket and press gasket firmly and evenly into gasket recess. Keep joint straight during assembly.

e. Push gland toward socket and center gland around pipe with gland lip against gasket.

f. Insert bolts and hand-tighten nuts.

g. If deflection is required, make deflection after joint assembly and prior to tightening bolts. Alternately tighten bolts approximately 180 degrees apart to seat gasket evenly. Bolt torque shall be as follows:

Pipe Diameter (inches)	Bolt Diameter (inches)	Range of Torque (ft-lbs)
3	5/8	45 to 60
4 to 24	3/4	75 to 90
30 to 36	1	100 to 120
42 to 48	1.25	120 to 150

h. Bolts and nuts, except those of stainless steel, shall be coated with two coats, minimum dry film thickness of eight mils each, of high build solids epoxy or bituminous coating manufactured by Tnemec, or equal.

i. Restrained mechanical joints shall be in accordance with Section 40 05 19, Ductile Iron Pipe.

2. Ductile Iron Push-On Joint Pipe:

    a. Prior to assembling joints, thoroughly clean with wire brush the last eight inches of exterior surface of spigot and interior surface of bell, except where joints are lined or coated with a protective lining or coating.

    b. Wipe clean rubber gaskets and flex gaskets until resilient. Conform to manufacturer's instructions for procedures to ensure gasket resiliency when assembling joints in cold weather.

    c. Insert gasket into joint recess and smooth out entire circumference of gasket to remove bulges and to prevent interference with proper entry of spigot of entering pipe.

    d. Immediately prior to joint assembly, apply thin film of pipe manufacturer's recommended lubricant to surface of gasket that will come in contact with entering spigot end of pipe or apply a thin film of lubricant to outside of spigot of entering pipe.

    e. For assembly, center spigot in pipe bell and push pipe forward until spigot just makes contact with rubber gasket. After gasket is compressed and before pipe is pushed or pulled in the rest of the way, carefully check gasket for proper position around the full circumference of joint. Final assembly shall be made by forcing spigot end of entering pipe past gasket until spigot makes contact with base of the bell. When more than a reasonable amount of force is required to assemble the joint, remove spigot end of pipe to verify proper positioning of gasket. Do not use gaskets that have been scored or otherwise damaged.

    f. Maintain an adequate supply of gaskets and joint lubricant at the Site when pipe jointing operations are in progress.

3. Ductile Iron Proprietary Joints:

    a. Install pipe that utilizes proprietary joints for restraint specified in SECTION 40 05 19 – Ductile Iron Pipe, or other such joints, in accordance with manufacturer's instructions.

4. Thermoplastic Pipe Joints:

    a. Solvent Cement Welded Joints:

        1) Bevel pipe ends and remove all burrs before making joints. Clean pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F. Do not make solvent cement welded joints in wet conditions.

        2) Use solvent cement supplied or recommended by pipe manufacturer.

3) Apply joint primer and solvent cement and assemble joints in accordance with recommendations and instructions of manufacturer of joint materials and pipe manufacturer.

4) Take appropriate safety precautions when using joint primers and solvent cements. Allow air to circulate freely through pipelines to allow solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.

b. Bell and Spigot Joints:

1) Bevel pipe ends, remove all burrs, and provide a reference mark at correct distance from pipe end before making joints.

2) Clean spigot end and bell thoroughly before making the joint. Insert O-ring gasket while ensuring that gasket is properly oriented. Lubricate spigot with manufacturer's recommended lubricant. Do not lubricate bell and O-ring. Insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.

5. Mechanical Coupling Joints:

a. Mechanical couplings include: sleeve-type flexible couplings, split flexible couplings, ANSI/AWWA C606 grooved or shouldered end couplings, plasticized PVC couplings, and other mechanical couplings specified in SECTION 40 05 06 – Couplers, Adapters, and Specials for Process Piping.

b. Prior to installing and assembling mechanical couplings, thoroughly clean joint ends with wire brush to remove foreign matter.

c. For mechanical couplings that incorporate gaskets, after cleaning apply lubricant to rubber gasket or inside of coupling housing and to joint ends. After lubrication, install gasket around joint end of previously installed piece and mate joint end of subsequent piece to installed piece. Position gasket and place coupling housing around gasket and over grooved or shouldered joint ends. Insert bolts and install nuts tightly by hand. Tighten bolts uniformly to produce an equal pressure on all parts of housing. When housing clamps meet metal to metal, joint is complete and further tightening is not required.

d. For plasticized PVC couplings, loosen the stainless steel clamping bands and remove clamps from coupling. Slide coupling over plain ends of pipes to be joined without using lubricants. Place clamps over each end of coupling at grooved section and tighten with torque wrench to torque recommended by manufacturer.

G. Backfilling:

1. Conform to applicable requirements of SECTION 31 23 00 – Earthwork.

2. Place backfill as Work progresses. Backfill by hand and use power tampers until pipe is covered by at least one foot of backfill.

H. Connections to Valves and Hydrants:

1. Install valves and hydrants as shown and indicated in the Contract Documents.

2. Provide suitable adapters when valves or hydrants and piping have different joint types.

3. Provide thrust restraint at all hydrants and at valves located at pipeline terminations.

I. Transitions from One Type of Pipe to Another:

1. Provide necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

J. Closures:

1. Provide closure pieces shown or required to complete the Work.

3.02 TRACER TAPE INSTALLATION

A. Pipe Polyethylene Underground Warning Tape for Metallic Pipelines:

1. Provide polyethylene tracer tape for buried metallic piping, which includes pipe that is steel, ductile iron, cast iron, concrete, copper, and corrugated metal.

2. Provide tracer tape 12 to 18 inches below finished grade, above and parallel to buried pipe.

3. For pipelines buried eight feet or greater below finished grade, provide second line of magnetic tracer tape 2.5 feet above crown of buried pipe, aligned along pipe centerline.

4. Tape shall be spread flat with message side up before backfilling.

B. Detectable Underground Warning Tape for Non-Metallic Pipelines:

1. Provide polyethylene tracer tape with aluminum backing for buried, non- metallic piping, which includes pipe that is PVC, CPVC, polyethylene, HDPE, FRP, ABS, and vitrified clay.

2. Provide magnetic tracer tape 12 to 18 inches below finished grade, above and parallel to buried pipe.

3. For pipelines buried eight feet or greater below finished grade, provide second line of magnetic tracer tape 2.5 feet above crown of buried pipe, aligned along the pipe centerline.

4. Tape shall be spread flat with message side up before backfilling.

3.03 THRUST RESTRAINT

A. Provide thrust restraint on pressure piping systems where shown or indicated in the Contract Documents.

B. Thrust restraint may be accomplished by using restrained pipe joints or concrete thrust blocks. Thrust restraints shall be designed for axial thrust exerted by test pressure as required by the OWNER.

C. Place concrete thrust blocks against undisturbed soil. Where undisturbed soil does not exist, or for projects where the Site consists of backfill material, thrust restraint shall be provided by restrained pipe joints.

D. Restrained Pipe Joints:

1. Pipe joints shall be restrained by means suitable for the type of pipe being installed.

a. Ductile Iron, Push-on Joints and Mechanical Joints: Restrain with proprietary restrained joint system as specified in Section 40 05 19, Ductile Iron Pipe; lugs and tie rods; or other joint restraint systems approved by ENGINEER.

b. Thermoplastic Joints: Where bell and spigot-type or other non-restrained joints are utilized, provide tie rods across joint or other suitable joint restraint system, subject to the approval of ENGINEER.

c. Prestressed Concrete Cylinder Pipe Joints: Restrain utilizing clamp type restrained joint, snap ring-type restrained joint, or by welding. Concrete pipe requiring restraint shall have sufficient longitudinal steel reinforcement provided to handle thrust forces at maximum design stress of 12,500 psi. Thrust forces in longitudinals must be transmitted directly to steel joint bands using welded connections sufficient to carry stresses involved. No allowance for the concrete to handle tensile forces is allowed. Thrust restraint shall be in accordance with ANSI/AWWA Manual M9.

d. Joints for Concrete Pipe Other than Prestressed Concrete Cylinder Pipe: Restrain joints utilizing clamp type restrained joint or snap ring-type restrained joint.

E. Concrete Thrust Blocks:

1. Provide concrete thrust blocks on pressure piping at changes in alignment of 15 degrees or more, at tees, plugs and caps, and where shown or indicated in the Contract Documents. Construct thrust blocks of Class B concrete, conforming to SECTION 03 30 00 – Cast in Place Concrete.

2. Install thrust blocks against undisturbed soil. Place concrete so that pipe and fitting joints are accessible for repair.

3. Concrete thrust block size shall be as shown on the Drawings or as approved by ENGINEER.

3.04 WORK AFFECTING EXISTING PIPING

A. Location of Existing Underground Facilities:

1. Locations of existing Underground Facilities shown on the Drawings should be considered approximate.

2. Determine the true location of existing Underground Facilities to which connections are to be made, crossed, and that could be disturbed, and determine location of Underground Facilities that could be disturbed during excavation and backfilling operations, or that may be affected by the Work.

3.05 FIELD QUALITY CONTROL

A. General:

1. Test all piping in this Section.

2. When authorities having jurisdiction are to witness tests, notify ENGINEER and authorities having jurisdiction in writing at least 48 hours in advance of testing.

3. Conduct all tests in presence of ENGINEER.

4. Remove or protect pipeline-mounted devices that could be damaged by testing.

5. Provide all apparatus and services required for testing, including:

a. Test pumps, compressors, hoses, calibrated gages, meters, test containers, valves, fittings, and temporary pumping systems required to maintain OWNER's operations.

b. Temporary bulkheads, bracing, blocking, and thrust restraints.

6. Provide air if an air test is required, power if pumping is required, and gases if gases are required.

7. Unless otherwise specified, OWNER will provide fluid required for hydrostatic testing. CONTRACTOR shall provide means to convey fluid for hydrostatic testing into piping being tested. CONTRACTOR shall provide fluid for other types of testing required.

8. Repair observed leaks and repair pipe that fails to meet acceptance criteria. Retest after repair.

9. Unless otherwise specified, testing shall include existing piping systems that connect with new piping system. Test existing pipe to nearest valve. Piping not installed by

CONTRACTOR and that fails the test shall be repaired upon authorization of OWNER. Unless otherwise included in the Work, repair of existing piping or Underground Facilities will be paid as extra Work.

B. Testing:

1. Unless otherwise specified, required test pressures are at lowest elevation of pipeline segment being tested.

2. Test Pressure:

a. Test pressure as required by the OWNER based on maximum anticipated sustained operating pressure and methods described in applicable ANSI/AWWA manual or standard that applies to the piping system.

C. Hydrostatic Testing:

1. Preparation for Testing:

a. For thermoplastic pipe, follow procedures described in Section 7 of ANSI/AWWA Standard C605.

b. For other piping follow procedures described in ANSI/AWWA Manual M9, except that minimum wetting period required immediately prior to testing for asbestos cement pipe shall be 24 hours rather than the 48 hours prescribed for concrete pipe. Wetting period is not required for pipe that is not cement mortar-lined.

2. Test Procedure:

a. Fill pipeline slowly to minimize air entrapment and surge pressures. Fill rate shall not exceed one foot of pipe length per second in pipe being tested.

b. Expel air from pipe as required. Obtain approval of ENGINEER prior to tapping pipe for expelling air.

c. Examine exposed joints and valves and make repairs to eliminate visible leakage.

d. After specified wetting period, add fluid as required to pressurize line to required test pressure. Maintain test pressure for a stabilization period of ten minutes before beginning test.

e. Timed test period shall not begin until after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.

f. Timed Test Period: After stabilization period, maintain test pressure for at least two hours. During timed testing period, add fluid as required to maintain pressure within five psig of required test pressure. Test pressure shall then remain steady for one hour, indicating no leakage.

g. Pump from test container to maintain test pressure. Measure volume of fluid pumped from test container and record on test report. Record pressure at test pump at 15 minute intervals for duration of test.

3. Allowable Leakage Rates: Leakage is defined as the quantity of fluid supplied to pipe segment being tested to maintain pressure within five psi of test pressure during timed test period. Allowable leakage rates for piping are:

a. Rates based on formula or table in ANSI/AWWA Manual M41:

1) Metal pipe joined with rubber gaskets as sealing members, including the following joint types:

a) Bell and spigot and push-on joints.

b) Mechanical joints.

c) Bolted sleeve type couplings.

d) Grooved and shouldered couplings.

b. Rates based on make-up allowance in ANSI/AWWA Manual M9:

1) Prestressed concrete cylinder pipe and other types of concrete pipe joined with O-ring rubber gasket sealing members.

c. Rates based on formula or table in ANSI/AWWA C605:

1) Plastic pipe joined with O-ring gasket sealing members.

D. Sewer Testing with Low Pressure Air:

1. Plug and bulkhead ends and lateral connections of pipe segment to be tested.

2. Required test pressure shall be increased by an amount equal to the elevation of groundwater above invert of lowest point of pipe segment being tested.

3. Test in accordance with requirements of authority having jurisdiction.

4. If there are no Laws and Regulations covering the test, use test procedures described in the following standards:

a. Thermoplastic and HDPE Pipe: ASTM F1417.

b. Concrete Pipe: ASTM C924.

E. Vertical Deflection Test for Thermoplastic, FRP, and HDPE Pipe:

1. Conduct vertical deflection test at least thirty days after backfill has been placed.

2. Manually pull pin-type vertical gauge mounted on sled through pipe. Gauge shall be manufactured by Quality Test Products, or equal. Set gauge so that sled will stop if vertical deflection of pipe exceeds five percent. Excavate and re-install piping that fails deflection test, and retest.

3. Use rigid ball or mandrel for deflection test, which shall have diameter of at least 95 percent of base inside diameter or average inside diameter of piping, depending on which is specified in applicable ASTM standard, including appendix, to which pipe is manufactured. Perform test without mechanical pulling devices. Re-install and retest pipe segments that exceed deflection of five percent.

3.06 CLEANING AND DISINFECTION

A. Cleaning, General: Clean pipe systems as follows:

1. Thoroughly clean all piping, including flushing with water, dry air, or inert gas as required, in manner approved by ENGINEER, prior to placing in service. Flush chlorine solution and sodium hypochlorite piping with water.

2. Piping 24-inch diameter and larger shall be inspected from inside and debris, dirt and foreign matter removed.

3. For piping that requires disinfection and has not been kept clean during storage or installation, swab each section individually before installation with five percent sodium hypochlorite solution.

B. Disinfection:

1. Disinfect all potable and finished water piping.

2. Suggested procedure for accomplishing complete and satisfactory disinfection is specified below.

   a. Prior to disinfection, clean piping as specified and flush thoroughly.

   b. Conform to procedures described in ANSI/AWWA C651. Use continuous feed method of disinfecting unless alternative method is acceptable to ENGINEER.

3. Water for initial flushing, testing, and disinfection will be furnished by OWNER. CONTRACTOR shall provide all temporary piping, hose, valves, appurtenances, and services required. Cost of water required for redisinfection will be paid by CONTRACTOR to OWNER at water utility's standard rates.

4. Chlorine shall be provided by CONTRACTOR.

5. Bacteriologic tests will be performed by OWNER. Certified test laboratory report will be provided to CONTRACTOR, if requested.

6. Chlorine concentration in water entering the piping shall be between 50 and 100 ppm, such that minimum residual concentration of 25 mg/L remains after 24-hour retention period. Disinfect piping and all related components. Repeat as necessary to provide complete disinfection.

7. After required retention period, flush chlorinated water to closed drain line, unless otherwise acceptable to ENGINEER. Properly dispose of chlorinated water in accordance with Laws and Regulations. Do not discharge chlorinated water to storm sewers, ditches, or overland.

END OF SECTION

SECTION 33 05 07
BORING AND JACKING

PART 1- GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, machinery, construction equipment and appliances required to perform in a good workmanlike manner all boring and jacking of pipeline casings and installation of pipe herein and/or shown on the Drawings.

1. The overall work scope shall include, but not be limited to, boring and jacking pits and equipment, sheeting, steel casing pipe, skid, steel straps, coatings, location signs as required, installation of the carrier pipe within the casings, isolators, and miscellaneous appurtenances to complete the entire work as shown on the Construction Drawings, and restoration of the site after completion.

2. Boring and jacking operations shall be performed within the right-of-way and/or easements shown on the Construction Drawings.

3. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable.

B. The equipment used in boring and jacking casings shall be of adequate commercial size and satisfactory working condition for safe operation and may be subject to approval by the OWNER at the discretion of the ENGINEER. Such approval, however, shall not relieve the CONTRACTOR of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workmen experienced in boring and jacking operations shall be used in performing the Work. CONTRACTOR will supply a list of employees or subs performing the bore and jack with at least 5 successfully performed years of operation and holding the required General Contractors license.

C. Provide all structures, safety equipment, traffic control, and professional services required to provide for the health and safety of the general public and of personnel involved in pipe boring and jacking work in accordance with the requirements of the regulatory agencies having jurisdiction.

D. Take all measures necessary to protect surrounding public and private property, adjacent buildings, roads, drives, sidewalks, drains, sewers, utilities, trees, structures, and appurtenances from damage due to pipe boring and jacking work.

E. Responsibility and payment for correction of such damage, including additional engineering and/or inspection costs incurred by the OWNER, shall be the sole responsibility of the CONTRACTOR.

1.02 REFERENCE DOCUMENTS

A. American Society for Testing and Materials (ASTM)

B. American Water Works Associations (AWWA)

C. American Welding Society (AWS)

D. Alabama Department of Transportation (ALDOT)

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Shop drawings to include:

1. Casing pipe material, including the standard to which it is manufactured, outside diameter, wall thickness, and joint configuration.

2. Details of casing spacers, including manufacturers recommended installation.

3. Details of end seals.

4. Boring & Jacking plan.

5. Means and methods of dewatering.

6. Design mixes of concrete, grout, and flowable fill.

7. Method of removing soils.

8. Installation of casing.

9. Backstop.

10. Shaft base materials.

11. Type of cutterhead.

12. Method of monitoring line & grade.

13. Detection of surface movement.

14. Procedure for installing pipe support, anchors, or placement of grout between carrier pipe and casing.

15. Bulkhead details and proposed positive method of anchoring carrier pipe to prevent flotation.

16. Procedure for monitoring line & grade.

17. Procedures for containment and disposal of any lubrication or other fluids used.

18. Procedures for securing open bore pits at the end of each work day.

B. Shop drawings and related manufacturer's product certification shall be made in accordance with the General and Special Conditions of the Contract for approval prior to purchase or fabrication of the material by the manufacturer.

C. Detailed drawings are required of all jack and bore pits.

D. Certification and test reports for the material, manufacturing, and test of the casing pipe shall be performed and furnished by the pipe manufacturer in accordance with the latest standards of the industry as referred to in part 1.02 herein.

E. For all installations, submit a jack and bore plan with sufficient information to establish the proposed installation strategy. All plans shall be reviewed and approved by ENGINEER prior to starting work. The plan shall include all the following information as applicable:

1. An indication where the leading edge of the casing is to be located with respect to the line and grade, and the intervals for checking line and grade during installation. Maintain a record of progress at the job site.

2. Equipment of adequate size and capability to install the product and include the equipment manufacturer's information for all power equipment used in the installation.

3. The means for controlling line and grade.

4. The means for centering the cutting head inside the borehole.

5. Provide a means for preventing voids by assuring:

   a. The rear of the cutting head shall not advance in front of the leading edge of the casing by more than 1 /3 times the casing diameter, and in stable cohesive soil conditions this distance shall not exceed 8 inches.

   b. In unstable conditions, such as granular soil, loose or flowable materials, the cutting head is retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement and soil conditions.

6. Adequate casing lubrication with a bentonite slurry, or other approved technique.

7. An adequate band around the leading edge of the casing to provide extra strength in loose unstable materials when the cutting head has been retracted into the casing to reduce skin friction as well as provide a method for the slurry lubricant to coat the outside of the casing.

8. At least 20 feet of full diameter auger at the leading end of the casing. Subsequent auger size may be reduced, but the reduced auger diameter must be at least 75% of the full

auger diameter.

9. Water to be injected inside the casing to facilitate spoil removal. The point injection shall be no closer than 2 feet from the leading edge of the casing.

10. Submit a copy of any design exception to the ENGINEER prior to installation. Design exceptions are issued by the ENGINEER in writing. Any deviation from the specifications requires a design exception.

11. If a railroad crossing is required, the CONTRACTOR shall obtain the appropriate insurance as required by the OWNER of the railroad at no additional cost.

1.04 RELATED WORK

A. SECTION 33 10 11 – Water Mains and Accessories.

B. SECTION 33 30 00 – Sanitary Sewerage.

C. All specifications of Division 33

D. ALDOT Utilities Manual

E. OWNER's Utilities Requirements

PART 2 - PRODUCTS

2.01 CASING PIPE

A. Steel pipe casings shall conform to the requirements of AWWA C200 and ASTM A139 (straight seam pipe only), be new and unused, Grade "B" with a minimum yield strength of 35,000 psi, meeting requirements of ASTM A36 and be of a thickness equal to or exceeding to the minimum gauge indicated on the Contract Drawings, and equal to or exceeding the requirement of the applicable governing agency. Pipe casing to be placed by jacking methods shall be of sufficient thickness and axial strength to withstand the forces to be encountered during the jacking process. The pipe shall be coated externally with coal-tar primer followed by hot coal-tar enamel in accordance with ANSI/AWWA C203. The casing shall be shop cut with ends square with centerline, leveled and welded so that the entire length of the casing shall be straight and true.

B. Field and shop welds of the casing pipes shall conform to the American Welding Society (AWS) standard specifications and shall be performed by qualified welders. Field welds shall be complete penetration (butt welded), single-bevel groove type joints in accordance with the requirements of the ANSI/AWWA C206. Welds shall be airtight, continuous over the entire circumference of the pipe, and shall not increase the outside pipe diameter by more than ¾-inch. Nor shall there be intrusion of the weld metal into the bore of the casing. It shall be the CONTRACTOR's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved.

C. The diameters of casing shown below and shown on the Drawings are minimum. With the OWNER's approval, larger casings may be provided for whatever reasons the CONTRACTOR may decide, whether it be casing size availability, line and grade tolerances, soil conditions, etc.

Pipe Diameter, Inches	*Casing Diameter, Inches*	*Wall Thickness (uncoated), Inches*
6	12	0.250
8	16	0.375
10	20	0.375
12	24	0.375
14	24	0.375
16	30	0.375
18	30	0.375
20	36	0.375
24	36	0.500
30	42	0.500

D. Railroad Crossing Casing Pipe

1. For railroad crossings the casing pipe shall be steel meeting the latest approved American Railway Engineering Association "Specifications for Pipelines for Carrying Flammable and Nonflammable Substances."

2. Unless otherwise requited by the agency having jurisdiction, the steel casing pipe shall have a minimum yield strength of 35,000 psi and shall have the minimum wall thickness shown in the following table:

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE FOR E72 LOADING		
CARRIER PIPE	**CASE PIPE**	**NOMINAL THICKNESS**
2	6	0.344inch
4	8	0.344inch
6	12	0.344inch
8	16	0.375 inch
10	20	0.407 inch
12	24	0.469 inch
14	27	0.505 inch
16	30	0.505 inch
18	30	0.505 inch
20	36	0.595 inch
24	36	0.595 inch

3. When the casing pipe is installed without benefit of a protective coating, the wall thickness shown above shall be increased to the nearest standard size, which is a maximum of 0.063 inch greater than the thickness shown.

4. Fully weld joints around circumference of the pipe with complete penetrations weld of sufficient strength to withstand forces at pipe joints without any distortion of pipe.

5. Reinforced concrete pipe: ASTM C76, minimum class IV with concrete joint and smooth exterior without bulge at joint. Use resilient material for placement in joint to prevent concrete damage when jacking forces are applied.

2.02 CARRIER PIPE

A. The carrier pipe shall be the same material as the pipeline unless otherwise directed by the OWNER.

B. The carrier pipe for natural gas shall be approved coated steel or polyethylene as specified in the material specifications section.

C. All carrier pipes shall be restrained joint in the casing.

D. Treat stainless steel metal surfaces and welds to reduce chemical reactivity of its surface.

2.03 AUGERING FLUIDS

A. Augering fluids shall use a mixture of bentonite clay, or other approved stabilizing agent, mixed with potable water with a minimum pH of 6.0 to create the drilling fluid for lubrication and stabilization, as necessary. Vary the fluid viscosity to best fit the soil conditions encountered. Do not use other chemicals or polymer surfactant in the drilling fluid without written consent of the ENGINEER. Certify in writing to the ENGINEER that any chemicals to be added are environmentally safe and not harmful or corrosive to the facility. Identify the source of water for mixing the drilling fluid. Approvals and permits are required for obtaining water from such sources as streams, rivers, ponds, or fire hydrants. Any water source used other than potable water shall require a pH test.

2.04 GROUT HOLES

A. For 24" and larger casing pipe, furnish casing pipe with 2-inch diameter preformed grout holes at centerline and crown for pressure grouting. Spacing of grout holes shall not exceed 5 feet.

2.05 GROUT FOR FILLING VOIDS OUTSIDE CASING

A. Description

1. Cement: ASTM C150, Type 1 or Type II

2. Water: See SECTION 03 30 00 – Cast-In-Place Concrete.

3. Sand: ASTM C404, Size No. 1

4. Voids between casing and existing ground: Min. compressive strength of 100 psi, attained within 24 hours, and sufficiently fluid to inject through lining and fill voids, with prompt setting to control grout flow.

B. Neat cement grout with a minimum compressive strength of 500 psi.

2.06 FILL MATERIAL FOR ANNULAR SPACE BETWEEN CASING PIPE AND CARRIER PIPE

A. If fill material is not required in the annular space, CONTRACTOR shall provide plastic chocks to minimize annular space between casing and fabricated casing spacer device.

B. For carrier pipe bedding and filling annular space between casing pipe and carrier pipe: 3 part ASTM, C 144- sand to 1 part ASTM C150 cement.

2.07 CASING SPACERS

A. Fabrication:

1. Polyethylene spacers shall be used. Each casing spacer shall have full length integrally molded skids extending beyond the bell or mechanical joint of the carrier pipe.

2. Spacer Band Material: Non-metallic (polypropelene) molded in segments for field assembly without any special tools.

3. Spacer Width: As recommended by spacer manufacturer for the specific application.

4. Spacer Runners:

a. Suitable for supporting the weight of carrier pipe.

b. Manufactured of material having a low coefficient of friction and designed to support the carrier pipe without damage or excessive wear.

5. Size: Sufficient to provide a minimum clearance of 2 inches between outside of carrier pipe bells or couplings and inside of casing.

6. Treat stainless steel metal surfaces and welds in order to reduce chemical reactivity of its surface.

2.08 CASING END SEALS

A. Minimum 1/8" thick, flexible neoprene rubber, conical shape, pull-on or wrap-around style with minimum 1/2" Type 304 stainless steel bands and manufactured for the purpose of end seals.

B. Manufacturers:

1. Advance Products & Systems, Model AC or AM

2. Pipeline Seal & Insulator, Inc., Model S or C

3. Maloney Technical Products, Multi.flex End Seal

4. Or equal (minimum 5 years of fabricating experience in the United States)

C. Concrete for Cradle or Filling Void between Casing and Carrier Pipe

1. See SECTION 03 30 00 – Cast-In-Place Concrete.

D. Flowable Fill for Filling Void between Casing and Carrier Pipe

1. See SECTION 03 30 00 – Cast-In-Place Concrete.

E. Surface Settlement Markers:

1. Within Bituminous Concrete Paved Areas: "p.k." nails.

2. Within nonpaved Areas: Iron pins.

3. On Concrete Surfaces: Paint.

F. Casing Pipe Access Manhole

1. When required on Drawings and following Standard Details.

G. Bulkheads

1. Follow Drawings or Standard Details

PART 3-EXECUTION

3.01 GENERAL

A. Confirm location of all known utilities prior to construction. Confirm the elevation of all utilities or structures to be crossed and provide to ENGINEER. Record elevations on plan set kept on the jobsite.

B. The installation of pipeline casings under the railroad, highway, or arterial or collector roads (as shown on the Construction Drawings) shall be in accordance with all the requirements of the railway company, the Alabama Department of Transportation, county where work is performed, or other governing regulatory agency.

C. The OWNER will provide necessary control points required by the CONTRACTOR for construction. The CONTRACTOR shall provide the detailed layout to keep the tunnel or bore on grade.

D. Interpretation of soil investigation reports and data, investigating the site and determination of the soil conditions is the sole responsibility of the CONTRACTOR. Any subsurface investigation performed by the CONTRACTOR must be approved by the appropriate authority having jurisdiction over the site.

E. Casing construction shall be performed so as not to interfere with, interrupt, or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The CONTRACTOR shall be responsible for all settlement resulting from casing operations and shall repair and restore all property to its original or better condition.

F. Face Protection: The face of the excavation shall be protected from the collapse of the soil or from debris entering the casing space.

G. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the CONTRACTOR. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the CONTRACTOR if approved by the OWNER. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal 20-foot length may be necessary.

H. Highway Crossings

1. The CONTRACTOR shall be held responsible and accountable for the coordinating and scheduling of all construction work within the highway right-of-way.

2. Work along or across the highway department rights-of-way shall be subject to inspection by such highway department.

3. All installations shall be performed to leave free flow in drainage ditches, pipes, culverts or other surface drainage facilities of the highway, street or its connections.

4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the highway department or agency who has ownership of the right-of way.

5. In no instance will the CONTRACTOR be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.

6. The CONTRACTOR shall be responsible for obtaining all permits in a timely manner.

7. The CONTRACTOR shall be responsible for maintaining an executed copy of the bore permit from the appropriate authority at all times.

I. Railroad Crossings

1. The CONTRACTOR shall secure permission from the Railroad to schedule work so as not to interfere with the operation of the Railroad.

2. The CONTRACTOR shall satisfy all permitting and insurance requirements of the railroad prior to beginning any work.

3. All work on the Railroad right-of-way including necessary support of tracks, safety of operations and other standard and incidental operation procedures may be under the supervision of the appropriate authorized representative of the Railroad affected and any decisions of this representative pertaining to construction and/or operations shall be final and construction must be governed by such decisions.

4. If, in the opinion of the Railroad, it becomes necessary to provide flagging protection, watchmen or the performance of any other work in order to keep the tracks safe for traffic, the CONTRACTOR shall coordinate such work.

5. No blasting shall be permitted within the Railroad right-of-way unless expressly permitted by the railroad. The CONTRACTOR shall be responsible for maintaining an executed copy of the bore permit from the appropriate authority at all times. CONTRACTOR shall be responsible to pay for all railroad permit and inspection fees.

3.02 EXCAVATION

A. A two-inch auger pilot hole shall first be attempted to determine if rock will prevent the installation of the casing. If the pilot hole is successfully made, the casing shall be installed.

B. The leading section of casing shall be equipped with a jacking head securely anchored thereto to prevent any wobble or variation in alignment during the jacking operation.

C. Excavation shall be performed entirely within the jacking head and no excavation in advance thereof shall be permitted. Every effort shall be made to avoid any loss of earth outside the jacking head.

D. Excavated material shall be removed from the casing as excavation progresses, and no accumulation of such material within the casing will be permitted.

E. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the project ENGINEER, cannot be removed through the casing, the project ENGINEER may authorize the CONTRACTOR to complete the crossing using an alternate method. An alternative method must be approved by the OWNER and agency authorizing the work by permit (i.e. Railroad, ALDOT, etc.).

F. At the CONTRACTOR's option the CONTRACTOR may continue to install the casing and remove the rock through the casing.

3.03 BORING AND JACKING

A. The boring and jacking operations shall be done simultaneously with correct line and grade carefully maintained for the casing. Holes for casing shall be bored with an auger mounted inside the pipe with the auger extending a short distance beyond the lead end of the pipe to preclude caving.

B. Excavation for jacking pits or shafts shall be in accordance with applicable sections of these specifications and all OSHA requirements.

C. Carrier pipes shall have manufacturer's restrained joints when the casing pipe contains pipe joints and shall be supported to prevent damages to either carrier pipe or casing pipe. The ends of the casing pipe shall be sealed with elastomeric end seals fastened with stainless steel bands installed at each end of casing after installation of the utility pipe.

D. The top of the casing shall maintain a minimum of 36-inch clearance under the roadway surface, ditch, inverts, or as indicated on the Construction Drawings.

E. The invert elevation of the steel casing for the individual roadway crossings shall be set in the field by the CONTRACTOR and shall be based on the minimum vertical clearance between the top of the carrier pipe, unless otherwise indicated on the Construction Drawings, and the existing utilities on either side of the crossing site unless noted on the Construction Drawings.

F. Casing invert elevations which are proposed by the CONTRACTOR shall be submitted to the Authority having jurisdiction over the roadway and the ENGINEER for approval prior to starting work.

G. Shaft

1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.

2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to soil and site conditions. Shaft design shall be prepared by a professional engineer licensed in the State of Alabama. Keep preparations dry during all operations. Perform pumping operations as necessary.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the project ENGINEER or OWNER, due to soil conditions.

H. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.

2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.

3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

I. Boring and jacking of casing pipes shall be accomplished by the auger boring method without jetting, sluicing or wetboring.

J. Auger the hole and jack the casing through the soil simultaneously.

K. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe installed.

L. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such to require the use of a shield.

M. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed, and the alignment and grade checked at minimum intervals of 60 feet.

N. Any casing pipe damaged in jacking operations shall be repaired or removed and replaced.

O. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the CONTRACTOR shall ensure that both ends of the casing sections being welded are square.

P. The CONTRACTOR shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

Q. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the CONTRACTOR.

R. Care shall be taken to ensure that casing pipe installed by the boring and jacking method will be at the proper alignment and grade.

S. The CONTRACTOR shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

T. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be removed.

U. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.

V. Grout backfill shall be used for unused holes or abandoned casing pipes.

W. Any replacement of the carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

3.04 GROUTING

A. After jacking is completed, the CONTRACTOR shall drill holes in the casing at the locations of ground loss and elsewhere where voids are suspected and shall force grout in to fill voids to refusal at satisfactory pressures, but not to exceed 50 psi. This shall be done only in casings with large enough diameter to provide adequate working room.

3.05 LOSS OF GROUND

A. Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the' extent practicable with soil cement consisting of a slightly moistened mixture of 1 part cement to 5 parts granular material. Where the soil is not suitable for this purpose, the CONTRACTOR shall provide suitable material at his expense.

B. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

3.06 TOLERANCES

A. Extreme care shall be exercised by the CONTRACTOR to maintain line and grade during jacking operation, and the CONTRACTOR may be required to modify the manner in which he is conducting his jacking operation to correct any deviation when deemed necessary by the OWNER or ENGINEER.

3.07 RESPONSIBILITY

A. The CONTRACTOR shall be fully responsible for means and method and the placement

of the casing. The details shown on the Construction Drawings are to be considered minimum only.

3.08 GROUNDWATER CONTROL

A. The CONTRACTOR shall control the groundwater throughout the construction of the casing.

B. Methods of dewatering shall be at the option and responsibility of the CONTRACTOR. Maintain close observation to detect the settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the project's ENGINEER immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum.

3.09 SURFACE SETTLEMENT MONITORING

A. Provide surface settlement markers, placed as specified and as directed by the project's ENGINEER or the owner of right-of-way.

B. The CONTRACTOR shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the direction of the project ENGINEER or jurisdictional owner.

C. Promptly report any settlement and horizontal movement immediately to the project ENGINEER and OWNER or entity having jurisdictional control over the roadway.

3.10 INSTALLATION OF PIPE

A. The pipe shall be installed in the casing using approved manufactured casing spacer centered on pipe length.

B. The pressure of sliding carrier pipe into the casing shall not be applied directly to carrier pipe. A plank, timber, or other material acceptable to the ENGINEER shall be placed over the pipe end, during pushing, to protect it from damage.

C. Adjust the pipe grade as required by changing the thickness of the spacers to compensate for any grade variations of the casing. Any sag in the carrier pipe is unacceptable.

D. If the alignment of the casing is such that the pipe grade cannot be met, the grade of the pipe shall be adjusted, if required by the ENGINEER. If realignment is not deemed feasible, another casing meeting the required grade shall be installed. The abandoned casing shall be filled with grout and the ends plugged with 12-inch-thick masonry plugs. Realignment or replacement work shall in no way result in extra cost to the OWNER.

E. Ends of casing pipe shall be sealed with elastomeric end seals fastened with stainless steel bands and shall be installed at each end of casing.

3.11 INSURANCE REQUIREMENTS AND FEES

A. With respect to railway line crossings, the CONTRACTOR shall provide insurance in accordance with the railroad company requirements.

B. All work performed within the State of Alabama Department of Transportation rights-of-way or within Railroad property limits shall be in accordance with the requirements of those agencies which are hereby made a part of these specifications. It is the responsibility of the CONTRACTOR to determine all requirements of these agencies and to comply with said requirements including any necessary bonds, cash deposits, or insurance.

C. The CONTRACTOR will not be permitted to commence work on a railroad or highway crossing until bonds, cash deposits, or insurance furnished pursuant to the above by the CONTRACTOR is to the satisfaction of the Railroad Company or Alabama Department of Transportation.

3.12 SUCCESSFUL COMPLETION

A. The CONTRACTOR shall be considered as having completed the requirements of any one boring or jacking when he has successfully completed the work to the satisfaction of the ENGINEER of Record.

B. The locations of any second or third attempts shall have the concurrence of the ENGINEER, or Inspector. If, after three attempts, the CONTRACTOR is not able to compete a boring or jacking, he may request authorization to use a trench. If such authorization is granted, the installation of the pipe and restoration of the surface shall be at no additional cost except that the CONTRACTOR shall be reimbursed for any casing abandoned in place. If such authorization is not granted and the CONTRACTOR is required to utilize other methods approved by the OWNER or entity having jurisdiction over the roadway, it shall be considered additional work. However, appropriate credit shall be given for not having performed the borings or trenching.

END OF SECTION

SECTION 33 10 11
WATER MAINS AND ACCESSORIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Pipe

B. Fittings

C. Valves

D. Pressure Regulator Assembly

E. Fire Hydrant Assembly

F. Pipe Cleansing Blowoff Assembly

G. Flushing, Pressure Testing, and Disinfection

H. Short Side New Services

I. Long Side New Services

J. Services Transfers

K. Automatic Air Relief Valves

L. Blow Off Assembly

M. Purchase Meter Assembly

N. Miscellaneous Accessories

1.02 RELATED SECTIONS

A. SECTION 31 05 13 – Soil Materials

B. SECTION 31 23 33 – Trenching and Backfilling

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Pipe: By the linear foot; includes unclassified excavation, pipe material and installation, bedding and backfill material, compaction, tracer wire and locator tape as required, pipe markers, concrete thrust restraints, restrained joint gaskets when needed, retainer glands when needed, and any miscellaneous appurtenances for a complete installation.

B. Casing Pipe: By the linear foot; includes casing pipe, trenchless installation, casing spacers, end seals, carrier pipe, retainer glands when needed, restrained joint gaskets when needed, and any miscellaneous appurtenances for a complete installation.

C. Fittings: By weight; includes ductile iron fittings, concrete thrust restraint, steel reinforcement when needed, retainer glands when needed, restrained joint gaskets when needed, plastic barrier between concrete and pipe/fitting, unclassified excavation, bedding and backfill, and all necessary accessories for a complete installation,

D. Valves: By the unit; includes valve, valve box, valve cover, adjustable riser, valve support, concrete encasement, locator wire pulled to valve box, valve marker, and all necessary accessories for a complete installation.

E. Fire Hydrant Assemblies: By the unit; includes unclassified excavation, hydrant tee on the main, 6" isolation gate valve, 6" restrained joint piping where required, concrete base, gravel sump, hydrant, painting, riser piping, and all necessary accessories for a complete installation.

F. Pipe Cleansing Blowoff Assemblies: By the unit; includes unclassified excavation, 6" Blowoff Pipe, connection to the main with a tee, 6" blind flange, 6" isolation gate valve, 6" restrained joint piping where required, concrete base, gravel sump, painting, riser piping, and all necessary accessories for a complete installation.

G. Short Side New Services: By the unit; includes connection to main, corporation cocks, backflow preventers, curb stops as required, purchase and placement of meter, service tubing between main and meter, and all necessary brass goods for a complete installation.

H. Long Side New Services: By the unit; includes connection to main, corporation cocks, backflow preventers, curb stops as required, purchase and placement of meter, service tubing between main and meter including bored casing beneath roadway, and all necessary brass goods for a complete installation.

I. Service Transfers: By the unit; includes disconnecting the service pipe from the existing main, tap in new main, corporation cock, sufficient service pipe to reconnect to existing service pipe or meter, relocating meter as required, and any appurtenances for a complete installation.

    1. Short Side Service Reconnection: By the unit; includes disconnecting the existing service pipe from the existing main, connection of new service pipe to new main, corporation cocks, relocation of meter as needed, service tubing between main and existing service line or meter, and any appurtenances for a complete installation.

    2. Long Side Service Reconnection: By the unit; includes disconnecting the existing service pipe from the existing main, connection of new service pipe to new main, corporation cocks, relocation of meter as needed, service tubing between main and existing service line or meter, including bored casing beneath roadway, and any appurtenances for a complete installation.

J. Automatic Air Release Valves: By the unit; Includes concrete vault, concrete doghouse manhole, or meter box, automatic air release valves, manhole cover, manhole steps, corporation stop, stainless-steel ball valves and other necessary brass goods, connection to main, unclassified excavation, stone fill, valve marker, and all necessary accessories for a complete installation.

K. Blow off Assembly: By the unit; includes excavation, 2-inch tap, 2-inch piping and fittings, 2-inch globe valve, concrete base, connection to main, gravel fill, precast concrete meter box w/ steel cover, and all accessories for a complete installation.

L. Meter Assembly: By the unit; Includes concrete valve box, purchase and placement of meter, Victaulic coupling, pipe supports, manhole steps, valves and all associated materials, drain sump with PVC drain, geotextile fabric, gravel fill, concrete thrust blocking, aluminum access hatch, piping and fittings as specified, and all other accessories for a complete installation.

1.04 REFERENCE STANDARDS

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in Drop.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ASTM B88 - Seamless Copper Water Tube.

E. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12-inch Drop.

F. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.

G. ASTM D1785 - Poly (VinylChloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

H. ASTM D2241 - Poly (VinylChloride) (PVC) Plastic Pipe(SDR-PR).

I. ASTM D2466 - Poly (VinylChloride) (PVC) Plastic Pipe Fittings, Schedule 40.

J. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

K. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

L. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

M. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

N. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

O. AWS A5.8 - Brazing Filler Metal.

P. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

Q. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids.

R. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

S. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

T. AWWA C515 – Resilient Wedge Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.

U. AWWA C502 - Dry Barrel Fire Hydrants.

V. AWWA C504 - Rubber Seated Butterfly Valves.

W. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS.

X. AWWA C509 - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.

Y. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.

Z. AWWA C606 - Grooved and Shouldered Type Joints.

AA. AWWA C651-23 Disinfecting Water Mains

BB. AWWA C652-19 Disinfection of Water Storage Facilities

CC. AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.

DD. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 1/2 inch through 3 inch, for Water

EE. UL 246 - Hydrants for Fire - Protection Service.

1.05 SUBMITTALS FOR REVIEW

A. When required by the OWNER, mill certificates showing the results of hydrostatic pressure tests made on all types of pipe as required by the manufacturer's specifications shall be furnished.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

1.06 SUBMITTALS FOR CLOSEOUT

A. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.07 SUBMITTALS AT PROJECT CLOSEOUT

A. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with the requirements of these specifications and the associated plans.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. All materials containing iron or steel used in the work shall be new and unused domestic materials of a reputable North American Manufacturer conforming to the applicable requirements of the Specifications, and no materials shall be used in the work until they have been approved by the ENGINEER.

D. The CONTRACTOR shall furnish all materials and incidental items, whether or not they are specifically described herein, necessary to complete all Work called for under this Contract, except as otherwise specifically noted or specified.

E. All AWWA references shall require the latest revision published.

1.09 DELIVERY STORAGE AND HANDLING

A. Deliver, store, protect, and handle products delivered or brought to site. The CONTRACTOR is responsible for theft or loss of all materials delivered to the project site. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe, pipe linings and pipe coatings. All pipe and fittings shall be examined upon delivery. Any damage to linings or coatings discovered during the examination shall be repaired to the satisfaction of the ENGINEER and shall be repaired in accordance with written repair procedure for the lining material furnished by the manufacturer so that the repaired area is equal to performance of the undamaged lining areas, at the cost of the CONTRACTOR, before proceeding with the work.

B. Pipe shall be transported to the job site on padded bunks or oak timbers and secured with steel banding or nylon tie down straps to adequately protect the pipe and coating. Slings, hooks, pipe tongs or other devices acceptable to the ENGINEER shall be used in pipe handling. No un-cushioned ropes, chairs, wedges, cables, or levers shall be used in handling finished pipe, fittings, or couplings. Under no circumstances shall the pipe or

fittings be dropped or skidded against each other. Care shall be taken to prevent marring the pipe coating. Padded wooden pipe cradles or chocks suitable for the protection of coatings shall be used between finished pipes and beneath them when pipes are placed upon rough surfaces. Pipe shall not be stored on bare ground unless soft sand berms are used to support the pipe and are approved by the ENGINEER.

C. Pipe shall not be stacked higher than the limits recommended by its manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Stacking shall conform to manufacturer's recommendations and/or AWWA C600.

D. Gaskets for mechanical and push-on joints to be stored shall be placed in a cool location out of direct sunlight and protected from damage by vermin. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

E. Deliver and store valves in shipping containers with labeling in place.

F. The CONTRACTOR shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a larger size and shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe or other material is damaged during transporting, unloading, handling or storing, the undamaged portions of the pipe or material may be used or if deemed sufficiently, the ENGINEER will reject the material as being unfit for installation.

G. Inspect all materials on delivery. Any defective material shall be permanently and visibly marked and removed from the job site and replaced with sound materials by the same supplier at no additional expense to the OWNER.

H. Unload all pipe according to manufacturer's directions for safe handling.

PART 2 – PRODUCTS

2.01 WATER PIPE

A. A manufacturer's representative shall be made available to the OWNER and OWNER's representative during the manufacturing furnishing, transporting, and unloading of the pipe during installation and testing of the pipe to assist in insuring that the pipe is properly fabricated, transported, unloaded, stored in the field, joined, and tested. The manufacturer's responsibilities relate only to the proper care and treatment of the pipe during these procedures and not the techniques or procedures used during installation and testing.

1. The designated factory representative shall be made available at any time the OWNER may request. The field or site representative shall be made available a minimum of 10 working days (time on site) during the project when requested by the OWNER.

2. The cost for the services of the factory representative, including expenses, shall be considered incidental to the project and will not be paid separately.

B. **Ductile Iron Pipe** shall be Pressure Class 350 unless otherwise noted in the Bid Proposal Form and shall be manufactured in accordance with ANSI/AWWA C151/A21.51-96 and designed for a working pressure of 350 psi plus 100 psi surge and a safety factor of 2 and a depth of cover as indicated on the drawings and specified in this section.

1. Unless specified otherwise, the standard laying condition shall be Type 3.

2. Unless otherwise noted in the Bid Proposal Form, buried pipe shall have single gasket push on joints.

3. Water pipe shall have an interior cement mortar lining of not less than 1/16" thick manufactured in accordance with ANSI/AWWA C104/A21.4, and an exterior asphaltic coating of not less than 1mil thickness meeting the requirements of ANSI/AWWA C151/A21.51 and C110.

4. Sewer pipe shall have a Protecto 401, Ceramapure, or equal protective interior coating over the cement lining in accordance with ASTM E-96-66, ASTM B-117, ASTM G-95 and ASTM D-714-87.

5. Flanged pipe shall conform to AWWA C115.

6. It is a requirement of these Contract Documents that all the ductile iron pipe under this section be designed and supplied by a single manufacturer rather than have selection and supply of these items by a number of different manufacturers. Similarly, it is a requirement of these Contract Documents to have all of the ductile iron fittings under this section designed and supplied by a single manufacturer rather than have selection and supply of these items by a number of different manufacturers. All connections between the pipe and fittings shall be compatible.

7. The Pressure Class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.

8. Inspection of the pipe and fittings will also be made by the ENGINEER or representative 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 pipe may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery (including defects from manufacturing or delivery/transport) shall be marked for identification and shall immediately be removed from the job at the CONTRACTOR's expense.

9. Flanged Joints

    a. Flanged pipe shall have flanges with long hubs, shop fitted on the threaded end of the pipe.

    b. Where required, flanges shall be tapped for stud bolts. Flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true, and

covered with coal tar pipe varnish or otherwise protected against corrosion of flange faces. Flange faces shall be cleaned to bare metal with a wire brush before installation of the pipe.

c. Ductile iron flanged joint pipe shall have a thickness of Class 350 minimum and shall conform to AWWA C110 and AWWA C115. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded, or flanged in the field. All pipe shall have 125 lb. flanges conforming to AWWA C110 unless otherwise specified.

d. Flanged joints shall be made up with through bolts of the required size. Bolts shall be zinc plated, with good and sound, well-fitting threads, so that the nuts may be turned freely by hand.

e. Flanged joints shall be made up using only full-face gaskets with a minimum thickness of 1/8". Ring gaskets are not acceptable. Gasket material shall be rubber or approved equal as recommended by the Manufacturer.

f. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together.

10. Mechanical Joints

a. All mechanical joint pipe shall be manufactured in accordance with AWWA C111. Pipe shall be manufactured in accordance with AWWA C151, and the pipe thickness shall be 350 psi class as determined by AWWA C150 unless otherwise noted.

b. All bolts shall be tightened by means of torque wrenches in such a manner that the follower shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.

c. Bolts for mechanical joints shall be high grade steel, low alloy type, with tee or hex head and American Standard threads. Mechanical joint gland shall be gray iron and shall utilize a plain rubber gasket. Nuts and bolts for restrained push on joints shall meet the requirements of the mechanical joint manufacturer.

11. Slip Joints

a. Slip or "push-on" joints shall be manufactured in accordance with AWWA C111. Pipe thickness shall be 350 psi class as determined by AWWA C150.

b. Bells of "slip" joint pipe shall be contoured to receive a bulb shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end in the bell until contact is made with the gasket and by exerting a sufficient impressive force to drive the joint home until plain end makes full contact with the base of the bell. No joint may exceed a maximum deflection of 2.5°.

12. Push on joint pipe shall have single gasket joints manufactured in accordance with ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

13. Flexible joint pipe shall be cast of 60-42-10 ductile iron and shall conform to American National Standard A21.51 Class 8. The joint shall be of the ball and socket type with the sockets; either cast or screwed on the pipe and may be either bolted or keyed. If of the bolted type, the bolts and nuts shall be made of either stainless steel or low alloy steel conforming to ANSI 21.11.

14. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51.

15. Nuts and Bolts for mechanical joints shall be high strength, heat treated, cast iron. Nuts shall be hexagon nuts. Bolts shall be tee head bolts. Nuts and bolts shall meet the requirements of ANSI/AWWA C111/A21.11. Nuts and bolts for restrained push-on joints shall meet the requirements of the joint manufacturer.

C. **High Density Polyethylene Pipe** used for potable water distribution mains shall be made of PE4710 with a hydrostatic design basis (HDB) of 1600 psi for water at 23 degrees Celsius and 630 psi for water at 60 degrees Celsius, and meet the requirements of AWWA C901/906, M55, ASTM D-3035, and ASTM F-714, ANSI/NSF Standard 61. For potable water applications, PE4710 shall conform to ASTM D3350 minimum cell classification PE445574C-CC3.

1. The pressure rating shall be as indicated on the plans but shall not be less than 200 psig (SDR 11). Allowable Total Pressure during Recurring Surge of 300 psi, Allowable total pressure during occasional surge of 400 psi, allowable hydrotest (field pressure) of 300 psi.

2. All Polyethylene Pipe used for potable water service shall have a blue stripe at a minimum.

3. Two-inch diameter and smaller polyethylene pipe may be supplied on coils. Six-inch diameter and less polyethylene pipe may be supplied on reels. Sizes larger than six inches in diameter shall be supplied in 40' sticks at a minimum.

4. Submit affirmation that the product shipped meets or exceeds the standards set forth in this specification. This shall be in the form of a written certification from the manufacturer attesting to the manufacturing process meeting the standards.

5. Standard pipe markings shall include the pipe nominal size, and OD base, material code, dimension ratio, pressure class, current AWWA C906 (if applicable), ASTM F714 (if applicable) and production date (day, month, year). Section 2.01.C of this specification is only meant to be a brief description of HDPE requirements. See SECTION 33 14 11 HDPE Water Distribution Piping, if applicable, for detailed specifications and requirements. Unless otherwise noted in the proposal, the following shall be used with all PE pipe:

a. Fittings: Ductile Iron

b. Joints: Butt fusion.

c. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with Water Service in large letters.

D. **Casing Pipe** shall be smooth uncoated welded steel pipe with walls not less than ¼ inch thick. Certain applications may require ½" wall thickness.

1. CONTRACTOR is required to consult with the ENGINEER if the wall thickness of casing pipe is not listed on the plan sheets.

2. Joints, if required, shall be made by butt-welding the pipe sections before jacking or pulling into final location.

3. There is minimum spacing required between the carrier pipe and the casing pipe. It is the CONTRACTOR's responsibility to coordinate the size of the casing pipe with the size of the casing spacers. If desired, the CONTRACTOR may use larger diameter steel casing, but payment for the larger size will be made at the unit price bid for the steel casing specified in these plans and specifications.

E. **PVC PIPE** shall be PVC C900 Pressure Class 305 DR14 unless stated otherwise on the plans. All PVC potable water pipe shall be blue in color. Submit verification that the pipe meets ASTM D 1599 to withstand a minimum burst pressure of 985 psi.

1. All pipe shall be installed with uniform bedding along the full length of the barrel of the pipe. Bedding shall be excavated to conform to the bell of the pipe joint. Minimum bending radius shall not exceed 275 feet.

2. If mechanical thrust restraint devices are used, they should be a type designed for use with PVC pipe. The devices should meet the test requirements of Uni-Bell's Specification Uni-B-13 "Joint Restraint Devices for Use with PVC Pipe".

3. The exterior of all PVC pipe shall bear a stamp which shows the AWWA certification, SDR, size, and NSF seal.

2.02 FITTINGS

A. **Ductile Iron Push on or Mechanical Joint Fittings** shall conform to AWWA C110 or C153, mechanical or push-on joints conforming to AWWA C111 and be provided with thin cement lining in accordance with AWWA C104.

B. **Ductile Iron Restrained Joint Fittings** shall conform to ANSI/AWWA C151/A21.51, ANSI/AWWA C110/A21.10, ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 and be provided with thin cement lining in accordance with AWWA C104. Restrained joints shall be provided where specified or may be provided at the CONTRACTOR's request, see following note.

CONTRACTOR Note: Upon approval by the ENGINEER restrained joint fittings along with restrained joint pipe may be used by the CONTRACTOR in lieu of concrete thrust restraints, if designed in accordance with manufacturers recommendations and design guidance provided by the Ductile Iron Pipe Research Association.

C. Where flanged pipe is used, ductile iron fittings shall be flanged in accordance with AWWA C153 or C110 where applicable for exposed piping. All flanges shall be Class 125 unless otherwise noted.

D. Fittings for all PVC pipe shall be ductile iron fittings, mechanical joint type in accordance with AWWA C110 and AWWA C111 for underground piping.

2.03 SERVICE PIPE AND APPURTENANCES

A. PEX Pipe

1. All service pipes must be high-density crosslinked polyethylene manufactured using high-pressure peroxide method of crosslinking (PEX). Pipe shall conform to ASTM F876, ASTM F877 CSA B137.5, and NSF/ANSI 61.

2. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature and 80 psi gauge pressure at 200°F temperature.

3. Pipe shall be certified by PPI to standard TR-3, with applicable plumbing and mechanical code certifications.

4. PEX pipe to have a co-extruded colored UV Shield made from UV-resistant polyethylene providing UV resistance.

5. Bend radius to conform to manufacturer's recommendations.

6. PEX expands and contracts with temperature changes. It should be secured to provide sufficient space for expansion and contraction to occur. Typical elongation is anywhere from 1" to 2.5" for every 100 feet of PEX pipe at a 100° F temperature rise.

7. PEX pipe should be labeled every 5 feet with the following information:

   a. Pipe manufacturer's name or trademark.

   b. Pipe Standard (ASTM F876, F877, AWWA C904 or CSA B137.5).

   c. Tube size and copper tube size (CTS)

   d. Pipe specified pressure/temperature ratings

   e. Plumbing pipe designation code

   f. SDR rating

g. Pipe manufactured for potable water must be labeled for that application.

B. Fittings

1. All fittings used with PEX water distribution pipe intended for plumbing applications shall be of the cold-expansion compression sleeve design.

2. All fittings shall be third-party certified to applicable standards.

3. Compression-sleeve fittings shall be manufactured of brass and shall be supplied by the piping manufacture as part of a proven cataloged system.

4. Fittings shall be wrapped as per the manufacturer's recommendation to protect the material.

C. Miscellaneous Appurtenances

1. Corporation stops shall be 3/4" in size unless otherwise noted and comply with AWWA C800-66.

2. Corporation stops shall be manufactured by Mueller and be of a ball curb with ground key design. Mueller H-15008 or approved equal for PEX service tubing; for copper tubing a Mueller H-1500 or approved equal shall be provided.

3. Curb Stops shall be 3/4" in size unless otherwise noted and shall comply with AWWA C800-66, Ford B-43-232W complete with lock out wing, or other approved equal. A full 3/4" opening curb stop shall be provided.

4. Service Clamps shall be used when connecting to PVC mains, "Mueller Bronze Service Clamp" or approved equal, especially designed for use on PVC pipe and provided with a corporation cock thread.

2.04 METER BOXES

A. Manufacturers:

1. NDS

2. Carson

3. DWS

4. Or approved equal

B. Meter boxes shall be approximately 12" x 17" x 12" deep, rectangular in shape, complete with plastic top and hinged reading lid, and cast-in magnet. The plastic shall be of the fiber reinforced polyolefin type.

C. **The OWNER may have a particular meter box brand or model that is preferred to maintain consistency throughout the system. CONTRACTOR shall verify this requirement of the OWNER prior to submitting a bid.**

2.05 CONCRETE METER VAULTS

A. Meter vaults for 3" & 4" meters to be approximately 6.0' x 4'.0 x 4.0' deep. Meter vaults for 6" meters to be approximately 8.0' x 6.0' x 4.0' deep with drainage hole installed in vault bottom. A minimum of 3 cubic feet of stone wrapped in geotextile fabric to be installed below the vault drain.

B. Vault openings for pipe to receive rubber boots to prevent soil intrusion into the vault.

C. Concrete meter vaults to be rectangular in shape, complete with two door aluminum hatch with hasp for locking capability.

D. **The OWNER may have a particular concrete meter vault brand or model that is preferred to maintain consistency throughout the system. CONTRACTOR shall verify this requirement of the OWNER prior to submitting a bid.**

2.06 VALVES

A. All gate valves shall be designed for a minimum working pressure of 250 psi unless otherwise specified. Valves shall have a clear waterway equal to the full nominal diameter of the pipe. Valves shall be opened by turning counterclockwise. Each valve shall have the initials or name of the maker, pressure rating, and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel for above ground installations or 2" square operating nut for below ground installations. All valves shall be installed with an extension where depth to operate exceeds 4'-0". Final depth of operator nut below final grade shall not exceed 4'-0". Valve extensions are incidental to the valve. Valves shall have an arrow cast in the metal indicating the direction of opening.

B. 2" Gate Valves

a. 2" gate valves shall be full body, resilient wedge built to manufacturer's standards with material and construction conforming to AWWA C-500, or ball curb stop.

b. Each valve shall have a 2" operating nut. Valves shall have screwed ends conforming to NPT standards.

C. Gate Valves – 3" to 14"

1. Manufacturers:

a. American Flow Control; Series 2500 Resilient Wedge Valve

b. U.S. Pipe and Foundry Corporation; METROSEAL 250 Resilient Seated Gate Valves

c. Approved Equal

2. Gate valves 3" through 12" diameter shall be ductile iron body (ASTM A536) , brass mounted, and be of the resilient seat type meeting the requirements set forth in AWWA C-509 and AWWA C-500.

   a. The valves shall have a manganese bronze having a minimum tensile strength of 60,000 psi non-rising stem, a double "O ring" stem seal, and a square-operating nut.

   b. The interior and exterior ferrous surfaces shall be coated with a minimum 8 mils of epoxy.

   c. The gate, body, bonnet, bonnet cover and wrench nut shall be cast iron (ASTM A126 Class B).

   d. The valves shall open by turning counterclockwise. They shall be manufactured in accordance with AWWA 515.

   e. The valves shall be rated for a working pressure of 250 psig and shall be tested to 500 psig.

   f. The nuts and bolts shall be electro-zinc plated steel (ASTM A307) unless underground where all nuts and bolts shall be stainless steel.

3. Valves to be installed underground (buried) shall be of the non-rising stem type and shall have mechanical joint connections and shall have transition gaskets when used with IPS PVC or HDPE pipe. Gate valves shall be installed with the piping in a continuous operation and set in a plumb position. Misaligned valve installation will not be accepted. Valve weight shall not be carried by the pipe.

4. Valves installed above ground or in structures shall have rising stems with outside stem and yoke and 18" diameter minimum hand wheel and shall have flanged ends with 125-pound flanges with drilling and dimensions meeting ANSI B16.1 Class 125, unless otherwise noted.

5. Valve Boxes shall be included in the unit price of the valve. They shall be made of cast iron and be of the two-piece adjustable heavy roadway type and conform to ASTM48. The inside diameter shall not be less than 5 ¼" and it shall have screwed type joints. The valve boxes shall be provided with a cast iron cover on which the word "WATER" is embossed and shall be suitable for installation on mains laid at the depths specified elsewhere in these specifications and as shown on the plans.

6. All valves where depth to operate exceeds 4'-0" shall be installed with a valve stem extension. The extension shall be a one-piece, solid-shaft assembly of the required

length to place the top of the 2" operating nut a maximum of 48 inches below finished grade. Valve stem extensions shall be included in the unit price of the valve.

a. The extension rod shall be a 1" minimum diameter solid steel bar. Materials shall be either stainless steel, type 304, or cold-rolled carbon steel compliant with ASTM A108. Carbon steel rods shall be fully coated with a corrosion-inhibiting, moisture-proof coating compatible with underground service.

b. The extension shall be furnished with a 2" square operating nut. The nut shall be constructed of ductile iron or stainless steel.

c. The extension shall include a heavy-duty coupling socket designed to fit securely over the valve's 2" operating nut. The coupling shall be made of ductile iron or stainless steel and shall attach to the valve nut with a minimum of two stainless steel hex head set screws.

d. All pins used to connect the rod to the top nut and bottom coupling shall be stainless steel.

D. Air and Vacuum Relief Valves

1. Manufacturers:

a. Apco

b. Bermad C50

c. Crispin

d. Approved Equal

2. Air and Vacuum Relief valves shall meet AWWA C-512. Valves shall be housed in a concrete vault, manhole, or meter box of sufficient size for proper maintenance. The size and model of valve shall be provided by the manufacturer and approved by the ENGINEER.

3. The single body combination air valve with multi-stage air release operation shall exhaust large quantities of air during the filling of a pipeline or vessel and automatically close after all the air has been vented. The valve shall continue to release small quantities of air under pressure as often as needed to keep the system free of accumulated air. The valve shall automatically open to allow air to re-enter during draining or whenever a negative pressure occurs.

4. The valve body shall have a threaded inlet and outlet up to 3-inch size, and ANSI B16.1 Class 125 flanged inlet threaded outlet in larger sizes. The body and float shall be 316 Stainless Steel. Internal parts shall be corrosion resistant high strength stainless steel. Valve body shall be tapped with a 1 -inch back flush port near the bottom to permit cleanout of large debris.

5. The valve body shall be supported by straps connected to the manhole or vault wall. 2" ball valves shall be placed prior to the valve as shown in the standard details connected to a 2" stainless tee tapped to the main via service saddle, epoxy coated, with double stainless-steel straps.

6. Combination air valves to be installed at all high points in the line.

7. Alternating air release and combination air valves to be installed at 1250 ft to 2500 ft intervals along long horizontal runs in a line.

8. Combination air valves to be installed in long descents at 1250 ft to 2500 ft intervals.

9. Air/vacuum valves to be installed at points of decrease in upslope in a line.

10. Combination air valve to be installed at points of increase in downward slope.

E. Precast Concrete Manhole

1. Precast concrete manhole bases, risers, and cones shall conform to ASTM C478, latest revision, for precast reinforced concrete manhole sections. Tapered sections and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified. Cast iron manhole covers and assemblies shall be cast into slab tops for access into manholes.

2. Minimum compressive strength of concrete shall be 4000 psi and the maximum permissible absorption shall be 6.5%. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square inches for larger sizes. Precast manhole sections shall fit together readily and shall have a self-contained "O"-ring rubber gasket conforming to ASTM 478.

3. The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the ENGINEER. The manhole sections shall be perpendicular to their longitudinal axis, within the limits listed in ASTM C478.

4. Castings for manhole frames and covers shall be tough, even grained soft gray iron, free from burnt on sand and other injurious defects and conform to the requirements of ASTM A48, Class 30, with "WATER" cast into the cover.

2.07 PRESSURE REGULATOR ASSEMBLY

A. Pressure reducing valves for main line installation shall be globe valves with ductile iron body and cover, and 125# flanged ends. Valves shall be equipped to allow return flow if pressure reversal occurs. Valves shall also be equipped with a stainless-steel position indicator. Valves shall be Watts Model 115-58 or approved equal.

2.08 FIRE HYDRANT ASSEMBLY

A. Manufacturers:

1. M&H Style 129

2. Mueller

3. Centurion

4. Approved Equal

B. Fire Hydrants shall be manufactured in accordance with AWWA C502-85 for dry barrel fire hydrants. The main valve shall open against the water pressure and all operating threads shall be isolated from the water.

C. Hydrants connected to mains 8" and larger shall have a main valve opening of not less than 5-1/4", two 2-1/2" hose connections and one 4-1/2" pumper connection. Hydrants shall be provided with a permanent lubricating device and "O-ring" packing seals to ensure the threads on the valve stem do not come in contact with water at any time. Hydrants shall open by turning to the left. Operating nuts shall be of the National Standard pentagon type, 1-1/2" point to flat. Hydrants shall be provided with a 6" mechanical joint shoe and shall be equipped with a retainer gland follower. Hydrants connected to 6" mains shall have a 4 1/2" main valve opening.

D. Fire hydrants shall be sized to connect with pipelines laid with a minimum cover of 36". In cases where the standard length of hydrant is not sufficient to leave a distance of at least 9" between the ground surface and the bottom of the lowest connection, the CONTRACTOR shall provide and install an extension section of the proper length. The cost for any extensions shall be included in the unit price bid for a fire hydrant assembly.

E. Hydrants shall be furnished with threading similar to the existing hydrants in the area. Prior to ordering, submittal data needs to be approved by the local fire department.

F. Included in the unit price bid for fire hydrant assemblies shall be a pre-cast concrete block or "donut", a minimum of 12" square or in diameter and 3" thick on which the hydrant shall stand.

G. Hydrants shall be provided with a primer and two coats of enamel, 6mm minimum, in color required by utility company and fire department.

H. Upon completion of the project the CONTRACTOR shall furnish to the OWNER one breakaway repair assembly; including sleeve, bolts, and gasket.

I. All iron parts within fire hydrants shall be ductile iron.

J. The bury length shall be 4'-0" unless ground conditions shown on the Drawings warrant a deeper bury.

K. Drain valves shall be all bronze and allow complete draining of all residual water from hydrant barrel.

L. All bolting and fasteners below ground shall be stainless steel.

M. The operating machine shall utilize two (2) "O"-ring seals between the revolving nut and bronze-sheathed upper section of the valve rod. The top of the rod shall also be fitted with a travel stop nut to limit downward travel of the rod. All-weather grease shall be used to provide permanent lubrication. A thermoplastic thrust washer shall be used to reduce friction in the thrust collar while opening the hydrant.

N. The hydrant inlet shall be mechanical joint. Joint restraint shall be accomplished for mechanical joint by use of mechanical joint gripper glands or ¾" diameter galvanized threaded rods.

2.09 MISCELLANEOUS ACCESSORIES

A. Blow off assemblies shall be installed at the end of dead-end lines, and where called for on the plans. The blow off assembly shall consist of a one quarter elbow set on the end of the main and a concrete thrust block poured against the elbow, a short section of threaded 2" steel pipe, a screwed 2" bronze globe valve (Kennedy or approved equal) set vertically, a large traffic model meter box, (Dexol 1116 or approved equal) and approximately 8" of gravel fill inside the box up to the valve stem.

B. Pipe Cleansing Blowoff Assemblies will be utilized for flushing of the completed pipeline prior to disinfection and pressure testing. The pipe cleansing blowoff assemblies will be installed where called out on the plans or as instructed by the ENGINEER or OWNER.

1. The pipe cleansing blowoff assembly shall consist of 6" blowoff pipe, 6" isolation gate valve, restrained joint piping where required, concrete base, gravel sump, painting, riser piping, ductile iron tee for connection to water main, and all other necessary materials for a complete installation.

2. The pipe cleansing blowoff assembly shall have the ability to have a fire hydrant barrel attached to the body of the assembly, instead of the 6" blowoff pipe or 6" blind flange.

3. The body of the assembly and all above grade fittings or accessories shall be painted with primer and two coats of enamel, 6mm minimum, in color required by utility company and fire department.

4. The 6" blowoff pipe shall be a 6" 90° flanged fitting or fitting approved by the ENGINEER. The fitting shall be installed pointing in a safe direction prior to flushing.

5. All bolting and fasteners below ground shall be stainless steel. All nuts and bolts shall be coated to prevent galling.

6. All iron parts within the pipe cleansing blowoff assemblies shall be ductile iron.

7. The bury length shall be 4'-0" unless ground conditions shown on the Drawings warrant a deeper bury.

8. After flushing, the 6" blowoff pipe shall be removed and turned over to the OWNER. A 6" blind flange will be installed in the blowoff pipes place.

C. Tapping Valves and Sleeves shall be of the mechanical joint or hub end type. Manufacturer shall be Mueller H-615, 667; U.S. Pipe T-9; American Flow Control; or approved equal. Included in the unit price bid for tapping valves / wet connections shall be the rental of the tapping machine and the delivery to the ENGINEER of the section cut from the pipe when the tap is made.

D. Tapping sleeves shall consist of 18-8 type 304 stainless steel full circumference band. The flanges shall meet AWWA C207 Class D, ANSI 150-pound drilling, recessed for tapping valve, fusion bonded. Gasket shall be Nitrile (Buna-N) NSF 61 compounded to resist water temperature up to 180°F.

E. Bolts and nuts shall be 18-8 type 304 stainless steel heavy hex nuts stud bolts and washers. Nuts and studs shall be coated to prevent galling.

F. The sleeves shall have flanged outlets which will accommodate the tapping valves. Valves will be identical to resilient wedge gate valves elsewhere specified with outlet end adaptable to the tapping machine and to provide mechanical joint connections to discharge pipes.

G. Casing Spacers shall be included in the unit price bid for casing pipe. Casing spacers shall be projection type totally non-metallic constructed of preformed sections of high-density polyethylene. Spacers shall have a minimum of projections around the circumference totaling the number of diameter inches of the carrier pipe. The projections shall be attached firmly to the carrier pipe and provide a tight fit within the casing pipe. The spacers shall be located on the carrier pipe in accordance with manufacturers recommendations, but they shall not exceed 6 ½ feet between spacers. Casing spacers shall be manufactured by RACI or approved equal.

H. Concrete Thrust Restraint shall be provided for each fitting along the pipeline, unless the CONTRACTOR has made provisions for other methods of restraint. Concrete thrust restraints shall consist of concrete with a minimum compressive strength at 28 days of 4,000 PSI. Maximum W/C ratio shall be 0.55. Concrete Thrust Restraint shall be designed in accordance with the Fourth Edition of Thrust Restraint for Ductile Iron Pipe as published by the Ductile Iron Pipe Research Association (DIPRA), for the pressure rating of the pipe being installed.

I. Valve Markers shall be placed at the location of all in-line valves (does not include fire hydrant valves). Valve markers shall be 4" square concrete marker posts, six feet long set to stand approximately 40" above ground. The markers shall be inscribed "WATER VALVE" or "WATER LINE" as appropriate and shall include a 2" square aluminum disk cast in the top. After setting the disc, the disc shall be die stamped with an arrow indicating the direction of the valve, and measured distance from the valve to the disc. Discs shall be marked "GV" for gate valve, "BV" for butterfly valve, and "ARV" for air relief valve.

All shall be clearly marked for water. Markers shall be by Hughes Supply or other approved equal.

J. Water line markers to be fiberglass and manufactured by Carsonite, H & 2 Industries, or approved equal. Markers to be spaced along centerline of main every 400 feet and every change of direction in the pipe. Waterline markers to be blue and labeled "WATER".

K. Corporation Cocks shall be ¾" in size unless otherwise noted and shall comply with AWWA C800-66, Mueller H-15008 or approved equal for PE service tubing; for copper tubing a Mueller H-15000 or approved equal shall be provided.

L. Curb Stops shall be ¾" in size unless otherwise noted and shall comply with AWWA C800-66, Ford B-43-232W complete with lock out wing, or other approved equal. A full ¾" opening curb stop shall be provided.

M. Service Clamps shall be used when connecting to PVC mains, "Mueller Bronze Service Clamp" or approved equal, especially designed for use on PVC pipe and provided with a corporation cock thread.

N. Tracer wire for horizontal directional drilling operations shall be 8-gauge, Copper Clad Steel (CCS), extruded with a 45 mil (minimum) HDPE coating, .219 inches (minimum) O.D. Rated break load 2,785 lbs., 30 volt, 21% IACS. The outside color of the wire shall meet the American Public Works Association (APWA) color code of the buried utility line. Tracer wire shall be Pro -Trace HDD-CCS PE45 as manufactured by Pro -Line Safety Products Co., or ENGINEER approved equal.

O. Non-metallic pipe shall receive tracer wire for direct bury shall be 12 gage solid insulated copper, installed with electrically continuous joints. The outside color of the wire shall meet the American Public Works Association (APWA) color code of the buried utility line. The marker wire shall be brought up into all valve and meter boxes so as to be readily accessible to water system operators. CONTRACTOR shall verify conductivity of all tracer wire prior to approval of installed pipe. Any tracer wire found to no longer be conductive shall be replaced at no cost to the OWNER.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and location of existing utilities prior to beginning construction.

B. It is the CONTRACTOR's responsibility to verify existing conditions prior to bid opening.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with bedding material.

B. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.03 BEDDING

A. Excavate pipe trench in accordance with the plans and specifications.

B. Form and place concrete for pipe thrust restraints at any change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide the volume of concrete recommended in the plans and by the Ductile Iron Pipe Research Association (DIPRA). Where plans and or these specifications differ, defer to the DIPRA guidelines. Concrete shall be allowed at least partial curing prior to backfill. Concrete for thrust blocks to be allowed to cure to 75% of the specified compressive strength prior to hydrostatic testing.

C. Pipe bedding to be excavated to accommodate the pipe bell at each joint and prevent pipe from resting on bell ends. Backfill with stone and tamp to spring line of the pipe. Cover pipe completely with stone bedding before using native soil.

3.04 INSTALLATION – PIPE

A. Maintain separation of water main from sewer piping in accordance with recommendations from the Design Guidance of ADEM and any local regulatory codes. Unless more stringent regulations apply, maintain a minimum of 5' horizontal distance between any sewer lines and water lines. When crossing of lines is required the CONTRACTOR shall case the water main until there is a minimum of 5' of separation.

B. All pipe and fittings shall be kept clean until they are used in the work and shall be sound and thoroughly cleaned before laying. When laid, the pipe and fittings shall perform to the lines and grades required. When laying is not in progress, including lunch breaks, open ends of the pipe shall be closed by a watertight plug or other approved means. Sufficient backfill shall be placed to prevent flotation. The deflection at joints shall not exceed that recommended by the manufacturer.

C. Blocking will not be permitted. If any defective pipe or fitting is discovered after it has been laid, it shall be removed and replaced with a sound pipe or fitting in a satisfactory manner by the CONTRACTOR, at his/her own expense. The pipe interior shall be maintained dry and broom clean throughout the construction period.

D. Install ductile iron push-on joints and fittings to AWWA C600 and appendix B of AWWA C111. If there is a conflict, the manufacturer's instructions shall take precedence. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe. The joint surfaces shall be cleaned and lubricated and the plain end of the pipe shall be aligned with the bell of the pipe to which it is to be joined and pushed home.

E. Ductile iron Mechanical joints shall be assembled in strict accordance with the manufacturer's instructions, AWWA C600 and Appendix A of AWWA C111. If there is conflict, the manufacturer's instructions shall take precedence. Pipe shall be laid with bell ends looking ahead. To assemble the joints in the field, thoroughly clean and lubricate the joint surfaces and rubber gasket. Bolts shall be tightened to the specified torques. Under no condition shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to secure greater leverage.

F. Bolts in mechanical or restrained joints shall be tightened alternately and evenly. Restraint for mechanical joint pipe shall use retainer glands for restraining joint. All restrained mechanical joints shall be suitable for the specified test pressure.

G. Restrained joints shall be installed according to pipe manufacturer's instructions. Field cut restrained joints shall be designed so that no welding will be required on the pipe resulting in either damage to the inner lining or crystallization of the metal in the pipe wall.

H. Install polyethylene pipe to AWWA C901 and C906.

I. Route pipe in straight line with minimum number of bends and fittings.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints.

K. Install access fittings to permit proper flushing and disinfection of water system.

L. Position drains at low points, including hydrants and blow off assemblies.

M. Establish elevations of buried piping to ensure not less than 36 inches of cover.

N. Backfill trench in accordance with the plans and specifications.

O. Service taps shall be installed as pipe is laid.

P. All new mains shall be kept separated from existing water mains until bacteriological tests are approved.

3.05 CONNECTION TO STRUCTURES

A. Wherever a pipe 3-inch in diameter or larger passes from concrete to earth horizontally, two flexible joints spaced from 2 to 4 -ft apart depending on pipe size shall be installed, within 2 -ft of the exterior face of the wall, whether or not shown on the Drawings.

B. Unless otherwise specified, all pipes passing through a wall will utilize a wall sleeve designed to pass the thrust through the wall via restrained piping.

C. Piping underneath structures shall be concrete encased, using 2500 psi compressive strength concrete as specified in SECTION 03 30 00 – Cast In Place Concrete.

3.06 INSTALLATION – VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 4 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2-inch washed gravel encased in filter fabric to prevent soil intrusion into the gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

G. Paint hydrants in accordance with standards established by the local fire department and the OWNER.

3.07 PRESSURE TESTING

A. After the mains and appurtenances have been installed, they shall be subjected to a hydrostatic pressure test. Furnish all necessary equipment and labor for the hydrostatic pressure test on the pipelines. A motor driven test pump shall apply the pressure and an accurate recording pressure gauge shall be provided at a suitable point on the main. The test shall be conducted at 150% of the working pressure, but not less than 100 psi or greater than the pressure rating of the pipe. Provide suitable restrained bulkheads as required to complete the hydrostatic testing specified. Furnish gauges, meters, pressure pumps and other equipment needed to fill the line slowly and perform the required hydrostatic pressure tests.

B. Submit detailed test procedures and method for ENGINEER's review. In general, testing shall be conducted in accordance with AWWA C600. The method and procedures for performing the hydrostatic pressure test shall be approved by the ENGINEER. Submit the plan for testing to the ENGINEER at least 10 days before starting the test.

C. CONTRACTOR shall make any taps and furnish all necessary caps, plugs etc, as may be required in conjunction with performing the testing.

D. An air break shall be maintained at all times between the OWNER's distribution system and the CONTRACTOR's equipment to prevent cross -connection. The line shall be slowly filled with water and the specified test pressure shall be maintained in the pipe for the entire test period by means of a pump furnished by the CONTRACTOR. Provide accurate means for measuring the quantity of makeup water required to maintain this pressure.

E. All leaks evident at the surface shall be repaired and leakage eliminated regardless of the total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves and accessories shall be removed and replaced.

F. The test pressure shall be applied for not less than three hours on uncovered pipe and for not less than eight hours on covered pipe.

G. The test pressure must be maintained at a constant pressure and a meter and recorder shall measure the amount of make-up water required to maintain the test pressure.

H. The allowable leakage shall not exceed the value provided in the following formula:

$$L = [\, SD(P)^{1/2} \,] / 133{,}200$$

Where:

L = Allowable leakage in gallons / hour
S = Length of pipeline section being tested in feet
D = Normal diameter of pipe in inches
P = Average test pressure during test in p.s.i.g.

I. Provide pipe sizes, lengths tested, and the amount of water required during the test in a written certified report.

J. Any section of pipe which fails to pass the pressure test, shall be repaired and retested at the CONTRACTOR's expense until it passes.

K. The ENGINEER or ENGINEER's Authorized Representative shall document each test. Test documentation shall consist of the following data:

1. Name of the OWNER, CONTRACTOR, and ENGINEER
2. Name of CONTRACTOR's and ENGINEER's representatives conducting test.
3. Date of test.
4. Test designation describing limits of section being tested.
5. Type of pipe (PVC, ductile iron).
6. Pipe Manufacturer.
7. DR and Pressure Class of pipe.
8. Pipe lengths and corresponding diameters.
9. Test pressure in p.s.i.g.
10. Test duration (hour -minutes).
11. Calculation of Allowable Leakage
12. Documentation of measured leakage from meter. Graph of the test shall be signed and dated by the ENGINEER's Representative prior to beginning the test. The signed and dated graph shall be submitted to the ENGINEER at the end of a successful test.

TEST FORM
HYDROSTATIC PRESSURE & LEAKAGE TEST FOR WATER MAINS

Date:_____ Owner:_____

Engineer:_____ Representative:_____

Contractor:_____ Representative:_____

Description of Test Section Limits:_____

_____

_____

_____

_____

Pipe Manufacturer:_____

Type of Pipe:_____ DR and Pressure Class:_____

CALCULATION OF ALLOWABLE LEAKAGE

	A	B	C	D
Line Diameters Being Tested	Line Lengths (1,000's of Feet)	Allowable Leakage From Chart Gals/hour/1000ft	Test Duration (Hours)	Allowable Leakage Gallons (A) x (B) x (C)
TOTAL ALLOWABLE LEAKAGE IN GALLONS				

TEST DATA

1.	Water meter reading at end of pressurization.		Gallons
2.	Test pressure at beginning of test.		PSI
3.	Test pressure at end of test.		PSI
4.	Pressure loss (2)-(3) (5 psig Max)		PSI
5.	Water meter reading after pumping lines back to original		Gallons
6.	MEASURED LEAKAGE (5)-(1)		Gallons

Circle Test Result PASS FAIL

Signature of Engineer or Authorized Representative:_____

3.08 FLUSHING

A. New sections of water mains and water mains taken out of service for inspection, repair, or other activities, must be flushed, disinfected and tested for bacteriological quality prior to being reinstated for use by the customer. The primary function of water main flushing is to initially remove contamination left in the pipe after installation to remove dirt and debris.

B. **FLUSHING PROCEDURE**

1. **After leakage testing is completed, all lines should be flushed clean prior to disinfection.**

2. Provide a flushing velocity of at least 3.5 ft/s to 5.0 ft/s. This velocity may be obtained by using more than one hydrant (see table below). Maintain this flow rate until there have been two or three complete changes of water in the pipe, and the water leaving the hydrant is visibly clean.

3. **The CONTRACTOR is responsible for installing the required number of hydrants capable of achieving the required minimum flow rate, whether called for on the plans or not. There will be no additional payment made for installation of the necessary hydrants or their removal and capping of the hydrant location after proper flushing has been achieved should the hydrants not be a permanent fixture of the water main.**

Pipe Diameter	**Minimum Required Flow Rate**	**No. of Hydrants Required Open**
	Based on 3.5 ft/s at 40 psi	Based on a hydrant with one 63 mm (2 1/2") outlet.
100 mm (4")	140 GPM (9 L/s)	1
150 mm (6")	310 GPM (20 L/s)	1
200 mm (8")	550 GPM (35 L/s)	1
250 mm (10")	860 GPM (54 L/s)	1
300 mm (12")	1250 GPM (79 L/s)	2
400 mm (16")	2200 GPM (139 L/s)	2

4. **If adequate water cannot be provided to yield the proper velocity through the pipe, mechanical cleaning will be required.**

5. Isolate the line to be cleaned, ensure that customers requiring temporary service have enough water.

6. Verify that all valves in the section to be cleaned are fully opened.

7. Turn on the water and verify the direction of flow.

8. Run a full-sized bare swab through the main to prove the direction of flow.

9. Run a swab unit through the main, and measure the diameter of the unit upon exiting and introduce a crisscross type unit into the main that will just fit the true opening. Run a full-sized bare swab behind the crisscross unit to ensure a tight seal. Continue this process until a unit is discharged from the main in reusable condition.

10. Increase the size of the crisscross pigs in one-inch increments until the units that measure the same as the pipe inside diameter are being used. For pipes with a build-up of hard scale, such as carbonates, crisscross wire pigs can be used on the final pass.

11. Run a full-sized bare swab to sweep out any loose debris.

12. Flush thoroughly after each pig run.

13. Avoid applying more than two wire-brush pigs on the final pass, to prevent over-cleaning.

14. Launch the pigs from fire hydrants for mains of 200 mm (8") or smaller, or from concentric reducers, pipe couplings, spools, eccentric reducers, in-line launchers or by hand.

15. Have an operator with experience in proper main cleaning procedures act as the CONTRACTOR's agent to clean the main.

16. After the cleaning operation is completed, flush and disinfect (chlorinate) the main. When the main is reactivated, flush service lines and remove any temporary services.

3.09 DISINFECTION

A. After the pipelines, valves, fittings and appurtenances have been installed, tested, and flushed, they shall be disinfected in accordance with the method set forth in the latest edition of AWWA C651-23, ~~and all applicable ADEM regulations~~.

B. This procedure involves a preliminary flushing of the mains at a velocity of at least 3.5 feet per second, pumping a 50-ppm chlorine solution in the main through a corporation cock, filling the main slowly, allowing the chlorinated water to stand for 24 hours and then flushing out the main until the heavily chlorinated water has been discharged and a chlorine residual of 0.2 ppm has been achieved.

C. The cost of disinfecting the mains shall be included in the price bid, and the CONTRACTOR shall provide all required equipment and the chlorinating agent. He shall also make a tap in the main at the beginning of each section to be tested and shall provide the necessary corporation cocks.

D. The responsibility of ensuring satisfactory bacteriological samples shall be the CONTRACTOR's and he shall, if necessary, repeat the disinfection procedure until satisfactory results are obtained. The CONTRACTOR shall submit these samples to the

applicable regulatory agency for bacteriological analysis. Collection and submittal of the samples shall meet the requirements of the applicable regulatory agency.

E. Water for flushing and disinfecting are the responsibility of the CONTRACTOR.

END OF SECTION

SECTION 33 30 00
SANITARY SEWERAGE

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.

B. The extent of the sanitary sewerage system is indicated on the Drawings and as otherwise required by authorities having jurisdiction.

C. All fees and charges for sanitary sewerage service, taps, connections, permits, impact fees, etc., shall be paid by the CONTRACTOR from his/her contract amount.

1.02 RELATED SECTIONS

A. Section Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. SECTION 31 23 00 – Earthwork

2. SECTION 31 37 16 – Rip-Rap and Crushed Stone

3. SECTION 03 30 00 – Cast-in-Place Concrete

4. SECTION 01 57 13 – Temporary Erosion Control

5. SECTION 32 12 16 – Asphalt Paving

C. Related Specifications

1. ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

2. ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections

3. ASTM C 497: Test Methods for Concrete Pipe, Manhole Sections, or Tile

4. ASTM C 877: Specification for External Sealing Bands for Concrete Pipe, Manholes and Precast Box Sections

5. ASTM C 923: Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

6. ASTM C 990: Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

7. ASTM C 1244: Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

8. AASHTO M 199M/M 199-05: Precast Reinforced Concrete Manhole Sections

9. AASHTO T 280: Concrete Pipe, Manhole Sections, or Tile

10. State of Alabama Department of Transportation Standard Specifications for Highway Construction.

11. U. S. Department of Labor, Occupational Safety and Health Administration.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for piping, valves, fittings, and specialties.

2. Shop drawings for precast concrete sanitary manholes, including frames and covers.

a. Shop drawings for cast-in-place concrete or field-erected masonry sanitary manholes, if any, including frames and covers.

1.04 QUALITY ASSURANCE

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.

B. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage systems.

C. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

D. Pumping Stations must have a final inspection at the end of a one-year warranty period.

E. If during construction of the project, the site or project conditions reveal conflicts or harm to existing utilities either by vicinity or by destruction during construction, the CONTRACTOR must repair or relocate the existing utility at the CONTRACTOR or developer's expense. Failure to do this in a timely manner will result in suspension of the project or rejection of final acceptance of the project until the item is corrected. If a major break occurs and the CONTRACTOR does not correct immediately a repair will be made and billed to the CONTRACTOR.

F. All improvements will have a 1-year warranty beginning from the date of substantial completion.

1.05 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.

B. The CONTRACTOR shall maintain all drainage ways, gutters, etc. at all times. The CONTRACTOR shall remove any eroded or washed material that enters pipes, ditches, or streams.

C. The Contract shall provide erosion control as required to protect from damage surrounding areas. Erosion control measures shall meet all requirements of SECTION 01 57 13 - Temporary Erosion Control

1.06 SEQUENCING AND SCHEDULING

A. Coordinate connection to public sewer with utility company.

B. Coordinate with interior building sanitary drainage piping.

C. Coordinate with other utility work.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cleanouts:

a. Ancon, Inc

b. Josam Co

c. Smith (Jay R.) Mfg. Co.

d. Wade Div.; Tyler Pipe.

e. Zurn Industries, Inc.; Hydromechanics Div.

2. Underground Warning Tapes:

a. Allen Systems, Inc.; Reef Industries, Inc.

b. Brady (W.H.) Co.; Signmark Div.

c. Calpico, Inc.

d. Carlton Industries, Inc.

e. EMED Co., Inc.

f. Seton Name Plate Co.

2.02 PIPE & FITTINGS

A. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated below, refer to drawings for locations of each one, or if not indicated, selection is Installer's option.

B. Gravity Sewer

1. Ductile Iron Pipe shall meet the requirements of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, latest revision. Pressure classes and wall thicknesses shall be in accordance with bury depths and laying conditions as specified in the above mentioned standards. Minimum pressure class for buried pipe shall be 350 psi for pipes less than or equal to 12 inches, 250 psi for pipes less than or equal to 24 inches, and 150 psi for pipes greater than or equal to 30 inches. For depths of cuts greater than 8 feet, pipe wall thickness may be required to be greater than the minimum specified. The design parameters specified in ANSI/AWWA C151/A21.51, latest revision, shall be followed to determine the minimum pipe wall thickness under these conditions. Thickness of gravity sewers shall be based on an internal pressure of 0 psi gage or atmospheric pressure.

2. 4-inch green stripe must be painted along the top of all sanitary sewer gravity mains. Ductile Iron Pipe shall be installed under storm drains, under a depth of 3 feet to the top of the pipe, and over a depth of 12 feet to the top of the pipe.

3. All ductile iron pipe for underground installation shall be provided with an exterior bituminous coating of 1 mil minimum thickness. All ductile iron pipe shall have an interior cement mortar lining with a 40-mil thickness coating of Protecto 401 ceramic epoxy or approved equal.

4. PVC pipe shall be SDR 26 heavy wall sewer pipe meeting the requirements of ASTM D3034 for 4" to 15" gravity pipe and ASTM F679 for 18" and 21" gravity pipe. All PVC pipe shall be green in color and shall have green sanitary sewer marker tape buried with all mains and lateral.

5. Sewer laterals shall be Ductile Iron Pipe meeting the requirements of AWWA C151, pressure class 350 minimum, from the main to the property line if the depth of the sewer is over 12 feet or under 3 feet to the top of the pipe. Laterals between 3 and 12 feet to the top of the pipe may be SDR 26 meeting ASTM D3034. Laterals from the

property line to the structure may be Ductile Iron Pipe, class 350 minimum, Schedule 40 solid PVC pipe, or SDR 26 as approved by the Building Official or ENGINEER.

C. Force Main Sewers

1. Ductile Iron Pipe shall meet the requirements of AWWA9 C151, pressure class 350 minimum, for force main installations. A 4-inch green stripe must be painted along the top of all sanitary sewer gravity mains. PVC pipe shall not be used for force mains unless otherwise directed.

2. HDPE shall be a minimum of DR-11, 200 PSI. (IPS 3" and Smaller and DIPS 4" and Larger) Specification applies for both Laterals and Force Mains.

3. Gaskets for ductile iron pipe shall meet the requirements of AWWA C111 for rubber gaskets. Gaskets for PVC pipe shall be ASTM F477 elastomeric seals.

4. D.I. Pipe shall be manufactured by U.S. Pipe and Foundry or American Cast Iron Pipe Company only. Pipe from other manufacturers will not be accepted.

5. PVC Pipe shall be C900 DR25 (minimum) green pipe as manufactured by JM Eagle or equal.

D. Couplings

1. Rubber or elastomeric sleeve and stainless-steel band assembly fabricated to match outside diameters of pipes to be joined.

E. Sleeves

1. ASTM C 425, rubber for vitrified clay pipe; ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

F. Bands

1. Stainless steel, one at each pipe insert.

G. Fittings

1. Fittings on PVC or Ductile Iron force main piping shall be restrained joints as follows:

   a. Compact Ductile Iron in accordance with ANSI/AWWA C153/A21.53 with Mega-Lug type retainer glands with twist off nuts.

   b. Joint restraint may be provided using Lok-Ring or equivalent pipe joints.

c. Transition gaskets shall be used with pressure class PVC pipe to Ductile Transitions.

d. Fittings shall not be used on gravity sewer piping. All changes in direction on gravity piping shall occur at a manhole.

e. Connections of gravity sewers to old mains or repairs shall be performed with Imax style adapters. No Fernco style or metal banding strap adapters allowed.

f. Ductile iron sleeve style adapters allowed.

H. Encasement

1. Polyethylene encasement for ductile iron pipe shall meet the requirements of ANSI/AWWA C105/A21.5 and shall only be used around gas mains.

2. Casing pipe shall be ASTM A252, Grade 2, with casing spacers, minimum 4 per joint, and end seals.

I. Valves

1. All valves shall be AWWA C515 resilient seated gate valves, plug valves, etc. with ductile iron body and bonnet, bronze or 304SS stems, non-rising stems, and 2" square operating nut.

2. Valve Boxes shall be included in the unit price of the valve. They shall be made of cast iron and be of the two-piece adjustable heavy roadway type and conform to ASTM48. The inside diameter shall not be less than 5 ¼" and it shall have screwed type joints. The valve boxes shall be provided with a cast iron cover on which the word "SEWER" is embossed and shall be suitable for installation on mains laid at the depths specified elsewhere in these specifications and as shown on the plans.

3. Stainless Steel / Brass check valve and cut off valves shall be installed on all low-pressure force main laterals at the right of way / easement line.

2.03 MANHOLES

A. Precast Concrete Manholes: Normal traffic precast reinforced concrete in accordance with ASTM C 478, 48" minimum diameter, placed on a minimum of 4" of ¾" crushed stone, of depth indicated with provision for ASTM C 443 rubber gasket joints. All manhole covers shall be round.

1. Base Section: 6-inch minimum thickness monolithic base section for floor slab and 4-inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor of precast concrete inverts.

2. Riser Sections: 4-inch minimum thickness; 48-inch diameter, and lengths to provide depth indicated.

3. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone to match grade rings.

4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.

5. Gaskets: ASTM C 443, rubber.

6. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-inch equally spaced intervals.

7. Pipe Connectors: ASTM C 923, resilient, Kor-N-Seal of size required, for each pipe connecting to base section.

8. Channel and Bench: Concrete.

9. Manhole Frames: All manhole frames and covers shall be East Jordan Iron Works Model V-1480-1 or John Bouchard & Sons Model 1190 lettered "Sanitary Sewer" or approved equivalent. SEWER or STORM SEWER will not be accepted for lettering on sanitary sewer manholes.

10. External Manhole Sealing Sleeve to prevent inflow and infiltration shall be as manufactured by Sealing Systems, Inc. or approved equivalent.

11. Rings and covers must have plastic or rubber non-flood inserts installed on every manhole.

12. All manhole penetrations shall have Kor-N-Seal pipe connectors.

13. All precast manholes shall be new, unused manholes delivered directly from the manufacturer to the job site. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the outside of the barrel.

14. Manhole base, riser, transition, and cone sections shall have offset tongue and grove joints and shall be made watertight with pre-lubricated rubber gaskets conforming to ASTM C443 and butyl sealant water stops.

15. Manholes shall be assembled with the fewest number of sections to makeup the required height, thereby reducing the number of joints. The use of more than one riser section of 16" or less shall be prohibited.

B. Cast-in-Place Manholes (if any):

1. When the inside diameter of the largest pipe is 33" or greater, the manhole base may be cast-in-place.

2. The base must not be cast less than 4" or more 12" above the outside top of the main incoming or outgoing pipe.

3. Concrete used must be Class "A" Portland Cement Concrete. Slump must not exceed 2" as determined by the slump cone method of ASTM C143. All manhole covers shall be round. Minimum and maximum wall thicknesses for the cast-in-place sections must conform to the following table and strictly adhered to.

MINIMUM/MAXIMUM WALL THICKNESSES FOR CAST-IN-PLACE SECTIONS

Manhole Diameter (inches)	Minimum Wall Thickness (inches)	Maximum Wall Thickness (inches)
48	5	7
60	6	8
72	7	9
84	8	10
96	9	11

4. Inside diameters of the cast-in-place portions must equal the diameter of the manhole specified. Standard precast manhole riser sections and other components as specified in this Section must be used above the cast-in-place base to bring the manhole rim to grade.

5. Manholes with cast-in-place bases and all of the associated connections and joints must be capable of passing the leakage test as specified in these Specifications.

6. Cast-In-Place manholes must maintain the specified internal diameter throughout the manhole base and riser sections. The internal diameter must not be decreased until the cone section or flat slab top is placed. Cast-In-Place manhole base bottoms must be placed on a minimum of 4 inches of 3/4-inch crushed rock.

7. Cast-In-Place manhole bases must be 8 inches thick with #4 steel reinforcing bars placed at 12 inches on center each way. The reinforcing must be centered between the manhole invert and bedding.

8. Concrete on the cast portion may be placed against undisturbed earth provided wall if thickness requirements can be met; otherwise, outside forms are required. Forms must be removed, and the structure visually inspected prior to backfill. All rock pockets, cracks, or other defects must be patched in conformance with these specifications.

9. Standard concentric cones conforming to ASTM C478 must be used on all manholes shown on the Plans unless otherwise specified. Where depth is insufficient for cones, concentric flat slab tops must be used.

10. Joints in precast manhole shafts must be sealed by buttering the joint space of the previously laid barrel section or base with mortar or must be sealed with preformed plastic sealing compound and installed as recommended by the manufacturer. All joint surfaces must be thoroughly cleaned prior to placing the sealing compound or buttering with mortar. The inside and outside of mortared joints must be plastered with mortar

and the inside brushed to a smooth finish with a wet brush. Special precautions must be taken to see that the entire joint space is filled with mortar and is watertight.

11. The joint between the manhole frame and the cone or grade ring must be sealed by buttering the joint space with mortar or using an epoxy adhesive.

12. The in-place depth of the 24-inch manhole opening must not exceed 18 inches from the top of the frame to the top of the cone. If the manhole is a flat slab top, or if the depth of the opening must exceed 18 inches, a 36-inch frame and cover with corresponding 36-inch manhole components must be used. The depth of a 36-inch opening as described above must not exceed 24 inches.

13. Components for construction of manholes must be selected to provide the least achievable vertical dimension between the finished frame surface and the top of the cone or soffit of the flat slab top. The depth of precast grade rings or cast-in-place grade rings must not exceed 8 inches on new or reconstructed manholes.

14. At the CONTRACTOR's option, the manhole frame and cover size may be increased from 24 to 36 inches if necessary to facilitate testing of the storm drain system. No additional compensation will be paid to the CONTRACTOR if the CONTRACTOR elects to increase the size, and the manhole frame and cover will be paid for at the unit price bid for the 24-inch frame and cover. If the CONTRACTOR elects to install a 36-inch frame and cover, it must remain as a permanent part of the improvements (i.e. it must not be replaced with a 24-inch frame and cover after testing).

15. All castings must be manufactured true to pattern and with satisfactory fit of all component parts. Round frames and covers must have machined bearing surfaces. Manhole covers that do not fit neatly and bear firmly in the ring will be rejected.

16. Unless otherwise specified, exposed surfaces of the castings with the parts assembled and disassembled must be painted with commercial quality asphalt paint after testing and assembly.

17. Bottom, Walls, and Top: Reinforced concrete.

18. Channel and Bench: Concrete.

19. Steps: Cast into sidewall at 12- to 16-inch intervals.

2.04 MANHOLE STEPS

A. General: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Copolymer Polypropylene Plastic Coating over ½ inch minimum Grade 60 steel reinforcing, 12-inches wide, with slip resistant surface.

2. Manhole steps shall conform to ASTM C478 as manufactured by M.A. Industries, Model PSI-PF, or Equal.

2.05 MANHOLE FRAME AND COVERS

A. Manhole frames and covers shall be close-grained, cast-iron, smooth, clean, free of blisters, blowholes and other defects and conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure a flat, fine surface. Castings judged to be defective by the OWNER or ENGINEER will be rejected and shall be replaced by the CONTRACTOR.

B. Covers and frames shall be "heavy-duty" type, rated for a minimum of H-20 loading. Covers and frames shall be made in the United States. All castings shall be clearly marked with the manufacturer's name, product catalog No. and made in the U.S.A. in cast letters.

C. Manhole covers shall be cast with two non-penetrating type pick holes. Covers shall not have vent holes.

D. Manhole frames and covers shall be of either Standard Type (non-bolted) or Watertight Type (bolt-down), as indicated on the drawings. If not indicated, manhole covers shall be standard type. In locations where the manhole rim elevation is below the 100-year flood elevation, manhole frame and covers shall be Watertight Type.

2.06 CLEANOUTS

A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.

2.07 AIR RELIEF VALVE

A. General: Combination air relief / air vacuum valves shall be installed at high points along the force main to prevent air entrapment. Air relief (release, dual function, universal, air and vacuum, etc.) valves shall be vented into a 4-foot manhole cone section with riser ring and rim. An air relief valve shall be installed within the valve vault at each pump station site, where indicated in the contract documents. The floor of the assembly shall be covered with a minimum of 4 inches of washed stone. The air jet shall be directed down onto a splash pad. Gate valve attachments shall be rotated to provide easy operation. The force main valves shall have stainless internals and trim. The assembly shall be secured by anchorage to the manhole wall to prevent flexing and vibration under surge. Air relief valves shall have a 2" inlet and 2" outlet. In no case shall require air capacity through the valve to relieve vacuum be less than 5 psi. Valves shall be positioned at all high points and at spacings approximately 2,000 feet apart on long ascending or descending runs. All valves shall be capable of venting air or breaking vacuum.

B. Combination air relief / air vacuum valves shall be ball type valves to be field located at high points in the sewer main. The valve shall operate through a compound lever system and shall have an orifice with valve sealing faces of an adjustable BUNA-N rubber valve and stainless steel and shall operate at 150 psig. The valve shall be 2" NPT threaded inlet and outlet connection, stainless steel float and trim. Valves that use a needle valve to seal

the orifice will not be acceptable. The valve shall be Bermad Model SW DN50 C50 SP P S NP suitable for wastewater.

2.08 IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

PART 3 – EXECUTION

3.01 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWAGE SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

D. Perform excavation to lines and grades established by the Drawings. Construct excavation a minimum of two (2) feet in diameter larger than the outside dimensions of the manhole base and sections.

E. If material in bottom of excavation is unsuitable for supporting manhole, excavate unsuitable material to a depth specified by the ENGINEER and backfill resulting void with ALDOT No. 57 crushed limestone.

F. Backfill around manholes constructed in paved areas or areas to be paved with ALDOT 825, Type "A". Compact backfill in 8-inch loose lifts to minimum density of 95% Standard Proctor Density with vibratory compaction equipment.

G. Backfill around manholes in unimproved areas and lawns with native materials, compacted in 8-inch loose lifts to minimum density of 95% Standard Proctor Density.

3.02 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS

A. Refer to Paragraph 2.02 above.

3.03 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.

F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

H. Ductile iron force main and gravity sewer pipe shall be installed in in accordance with AWWA C600.

I. PVC gravity sewer pipe shall be installed in accordance with ASTM D2321.

J. Manholes shall be installed at all changes in direction on gravity sewer piping.

K. All gravity sewer pipe shall be bedded in a minimum of 6" of ALDOT #8910 stone.

L. All gravity sewer pipe shall be backfilled to 12" minimum above the pipe with ALDOT #8910 or #57 stone.

M. All trenches under paving shall be backfilled completely with ALDOT #8910 stone.

N. The maximum allowable slope on gravity sewer piping is 12% without the ENGINEER's approval. All pipes on slopes over 10% will have concrete restraint collars on 50-foot centers with the first collar located at the face of the downstream manhole.

O. If a geotechnical engineer/tester is present, after reaching 12" of stone above the top of the sanitary sewer main, a geotextile fabric may be laid over the stone and compacted backfill installed in a maximum of 6" lifts reaching 98% compaction may be utilized if separate compaction test reports will be submitted otherwise all sanitary sewers within roads, parking lots, or paved areas will have to be backfilled with 100% stone.

P. Cleanouts are required on all force mains at locations directed by the ENGINEER and as shown on the plans at 400' increments or as directed.

Q. All Low-Pressure force mains shall be installed at 36" minimum cover to 60" maximum cover unless otherwise directed by the ENGINEER.

R. Low-Pressure Force Main / Force Mains shall be bedded in a minimum of 6" Stone (#8910) and stone shall extend above the pipe a minimum of 12".

S. Bedding:

1. Class "1" Bedding shall be ALDOT Standard Specifications for Highway Construction, Section 801, as follows:

   a. Gravity Pipe (ALL materials) – No. 57 crushed limestone.

   b. Pressure Pipe (material NOT PLASTIC) – No. 57 crushed limestone.

   c. Pressure Pipe (PLASTIC material) – No. 8910 crushed limestone.

2. Class "2" Bedding shall be reinforced concrete 3000 psi design mix.

3. Class "3" Bedding shall be native soil.

T. Select Backfill:

1. Select backfill where specified or required shall be crushed limestone. Crushed stone shall meet or exceed the requirements of the ALDOT Standard Specifications for Highway Construction, Section 825, Type "A".

U. Standard Backfill:

1. Standard backfill shall consist of native soils of good earth, sand, gravel, and shall be free of large rocks, boulders and other deleterious substances.

V. Pipe Joint Construction and Installation

1. Join and install PVC pipe as follows:

   a. Solvent cement joint pipe and fittings, joining with solvent cement in accordance with ASTM D 2855 and ASTM F 402.

   b. Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212, and for truss pipe ASTM D 2680, Appendix XI.

   c. Installation in accordance with ASTM D 2321.

   d. Maximum deflection at any joint shall be one-half the manufacturer's recommended maximum deflection allowed.

W. Manholes

1. General: Install manholes complete with accessories as indicated, of if not indicated, in compliance with project requirements and authorities having jurisdiction. Form continuous concrete or split pipe section channels and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.

    a. Place precast concrete manhole sections as indicated and install in accordance with ASTM C 891.

    b. Construct brick manholes as indicated.

    c. Construct cast-in-place manholes as indicated.

    d. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.

    e. Install manhole steps as indicated.

X. Placing Manhole Base and Sections:

1. Manholes shall be constructed to the sizes, shapes, dimensions and at the locations shown on the plans.

2. Precast manhole bases shall be set plumb and true to the lines and grades specified by the plans. Manholes out of plumb in excess of ¼ inch in eight (8) feet shall be reset.

3. Clean ends of manhole sections of foreign materials and inspect ends for damage.

4. Place pre-lubricated gasket into recess. Follow gasket and water stop manufacturers' installation instructions. Set manhole section.

5. When new openings are required in existing manholes, openings shall be core drilled.

Y. Granular Base

1. Remove standing water from excavation. Place 12-inches minimum of ALDOT #57 stone and compact with vibratory compaction equipment.

2. Excavations deeper than 12-inches below required grade of manhole base, not approved by the ENGINEER, shall be filled with ALDOT No. 57 crushed limestone and compacted by vibratory compaction equipment at no additional cost to the OWNER.

Z. Cleanouts

1. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where

location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

AA. Tap Connections

1. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.

2. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap, with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

3. Make branch connections from side into existing 4- to 21-inch piping by removing section of existing pipe and installing wye fitting, into existing piping. Encase entire wye with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

   a. Provide concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

   b. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

BB. Installation Of Identification

1. Install continuous plastic underground warning tape during back-filling of trench for underground service piping. Locate 8 to 12 inches below finished grade, directly over piping.

3.04 FIELD QUALITY CONTROL

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.

2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.

3. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.

3. ALL SEWER MAINS AND MANHOLES MUST BE VISUALLY INSPECTED BY THE OWNER'S REPRESENTATIVE AND ENGINEER, OR ENGINEER'S REPRESENTATIVE PRIOR TO BACKFILLING. ANY MAINS OR MANHOLES NOT INSPECTED PRIOR TO BACKFILL WILL NOT BE ACCEPTED.

4. A representative of the sewer department must be present when the cap on all service stub-outs is removed. At submerged stub-outs, the water level in the excavation must be lowered and help below the elevation of the cap until the cap is removed and the pipe is extended above the water level. Any caps removed without a representative of the sewer department present will result in rejection of the connection.

3.05 MANHOLE TESTING

A. All new manholes must be tested for leakage after assembly but prior to back-filling around the manhole.

B. The CONTRACTOR is responsible for conducting all leakage tests.

C. The CONTRACTOR is responsible for providing all equipment, materials, and labor for performing and making measurements of the leakage tests.

D. The ENGINEER or ENGINEER's Representative must witness all leakage tests and verify the accuracy and acceptability of the equipment utilized.

E. The ENGINEER or ENGINEER's Representative may require a manhole to be tested after backfilling if there is reason to suspect that the manhole has been disturbed during the backfilling operation or at other times during construction.

F. When leakage exceeds the amount allowed by these Specifications, the CONTRACTOR, at its own expense, must determine the source, or sources, of leakage and repair or replace all defective materials and workmanship to the satisfaction of the ENGINEER and OWNER.

G. The extent and type of repair that may be allowed, as well as results, are subject to the approval of the ENGINEER and OWNER.

H. The completed manhole installation must then be retested and required to meet the requirements of this Section. Any individually detectable leaks must be repaired, regardless of the results of the tests.

I. Manholes must be tested for leakage by the following method:

1. Manhole Vacuum Test

a. All lift holes, connections, and inside and outside joints must be sealed as described in this Section. All pipes entering the manhole must be plugged, taking care to securely brace the plug from being drawn into the manhole. Plugs and the ends of pipes connected by flexible boots must be blocked to prevent their movement during the vacuum test. When plugs are being placed, the pipe adjacent to the manhole must be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole.

b. A probable point of leakage is at the junction of the manhole and the pipe; therefore the plug must be placed in the connected pipes outside of the manhole base. The test head must be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations. In the case of flat slab top manholes, the test head must be placed at the top surface of the flat slab top. A vacuum of 10 inches of mercury (approximately 5 psi) must be drawn and the vacuum pump shut off. With the valves closed, the time must be measured for the vacuum to drop to 9 inches. The manhole passes the test if the measured time is greater than the times listed in the following Table for the particular manhole size.

MINIMUM VACUUM PASS TIMES

Manhole Size (inches)	Minimum time (seconds) to drop to 9" Hg
48	60
54	67
60	75
72	90
84	105
96	120

c. If the manhole fails the initial test, repairs must be made while the vacuum is still being drawn. Re-testing must continue until a satisfactory test is obtained.

2. Test by the Exfiltration Method

a. At the discretion of the ENGINEER, the CONTRACTOR can substitute the Exfiltration Method of testing for the Vacuum Test described in Section 3.05.I.1. This method can only be used when ground water is not present. If ground water is present, a Vacuum Test must be used unless otherwise directed by the ENGINEER. All backfilling and compaction must be completed prior to the commencement of testing.

b. The procedures for the test include the following:

1) Manhole section interiors must be carefully inspected; units found to have through wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating must be applied after the testing unless coating is applied before field assembly, or at the factory. All lift holes and exterior joints must be plugged with an acceptable non-shrink grout. Grout must not be placed in horizontal joints. Tests must be performed before grouting the invert or around pipe penetrations and before coating the interior surfaces of the manhole or junction box.

2) After cleaning the interior surface of the manhole, the CONTRACTOR must place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs must be as recommended by the plug manufacturer.

J. Failure to Pass the Test

1. If the manhole fails to pass the initial test method as described in Section 3.05.I.1, "Test by the Vacuum Method", of these Specifications, and, if allowed, the Exfiltration Test Method, per Section 3.10.B, of these Specifications, or if visible groundwater leakage into the manhole is observed, the CONTRACTOR must locate the leak, if necessary, by disassembling the manhole.

2. The CONTRACTOR must check the gaskets and replace them if necessary.

3. The CONTRACTOR may re-lubricate the joints and re-assemble the manhole, or the CONTRACTOR may install an acceptable exterior joint sealing product on all joints and then retest the manhole. If the CONTRACTOR chooses to attempt to repair the manhole rather than replace it, the manhole must be retested until it passes. Cold applied preformed plastic gaskets cannot be used for repair.

4. Records of all manhole testing must be made available to the ENGINEER at the close of each working day, or as otherwise directed by the ENGINEER.

5. Any damaged or visually defective products or any products out of acceptable tolerance must be removed from the site.

3.06 MEASUREMENT AND PAYMENT

A. The quantity of each type of manhole will be measured by the unit. The unit price paid for each manhole includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing manholes, complete in place, including excavation and backfill, manhole bases, mortar, concrete, reinforcement, and acceptance testing, as shown or specified in the Contract, specified in these Specifications, and directed by these the ENGINEER.

B. Payment for adjusting manholes will conform to these Specifications, with the following exceptions:

   1. The unit price paid includes all necessary excavation, backfill, sealing, and concrete; and

   2. The unit price paid will be the average of all depths and limits of adjustment required.

C. The unit price paid for manhole reconstruction includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in reconstructing manholes, complete in place, including excavation and backfill, demolition, disposal, mortar, concrete, and reinforcement as shown on the plans or specified in the Contract, in these Specifications, and as directed by the ENGINEER.

END OF SECTION

SECTION 33 30 01
ABANDONMENT OF SANITARY SEWERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Abandonment in place of existing sanitary sewers, manholes, and force mains.

1.02 UNIT PRICES

A. Measurement for grout fill and abandonment of existing gravity sewers is on a linear foot basis for each diameter of sewer being abandoned. Measurement will be along the centerline of the sewer from centerline to centerline of manholes.

B. Measurement for grout fill and abandonment of sanitary sewer manholes is by each manhole abandoned in conformance with this Section.

C. Payment will be full compensation for all material, equipment, and labor required for complete abandonment grouting, including air venting, testing, temporary plugs, pipes and all incidentals.

D. No separate payment will be made for plugging and abandoning sanitary sewer force mains. Include the cost of such abandonment in related work.

E. Acceptability of grout material is based on achieving an average strength of at least 75 as defined in Paragraph 2.01B.1.

1.03 DEFINITIONS

A. Abandonment. Sanitary sewer abandonment consists of demolition and removal of any portion of manholes existing within the specified depth of the surface, and the abandonment in place of sewer lines and manholes as specified in this Section.

B. Flowable Fill. Flowable fill (abandonment grout) shall be a controlled low-strength material consisting of a fluid mixture of cement, fly ash, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in sewer pipes or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access. The long-term hardened strength shall be within a specified range.

C. Ballast. Large aggregate either replaced with the voids subsequently filled with flowable fill injected by grouting method; or in areas with open access, placed individually and sequentially at the same time as the flowable fill placement.

D. Backgrouting. A secondary stage pressure grouting to ensure that voids have been filled within the abandoned sewer. Back grouting will only be required at critical locations indicated on the Drawings or if there is evidence of incomplete flowable fill placements.

1.04 SUBMITTALS

A. Submittals shall conform to requirements of all sections and provisions of these specifications.

B. Flowable fill mix design report:

1. Flowable fill type and production method.

2. Use of ballast. Provide percentage of ballast of the total placement and size limits for the ballast if fill is intended to be used with ballast.

3. Aggregate gradation of fill. The aggregate gradation of the mix (excluding ballast) shall be used as a pilot curve for quality control during production.

4. Fill mix constituents and proportions including materials by weight and volume, and air content but excluding ballast. Give types and amounts of admixtures including air entrainment or air generating compounds.

5. Fill densities and viscosities, including wet density at the point of placement.

6. Initial time of set.

7. Bleeding and shrinkage.

8. Compressive strength.

C. Technical information for equipment and operational procedures including projected slurry injection rate, grout pressure, method of controlling grout pressure, bulkhead and vent design, and number of stages of grout application.

D. Experience record for the proposed crew, showing a minimum of 5 similar projects using the proposed or similar equipment and methods.

E. At least 60 days prior to commencing any abandonment activities, submit a plan for abandonment, describing the proposed grouting sequence, bypass pumping requirements and plugging, if any, and other information pertinent to completion of the work.

PART 2 - PRODUCTS

2.01 FLOWABLE FILL

A. Design Mix Criteria. Provide design of one or more mixes to meet the design criteria and conditions for placement. Present the information required by Paragraph 1.05B in the mix design report including the following:

1. Cement: ASTM C150 Type I or II. Volume and weight per cubic yard of fill. Provide minimum cement content of 100 pounds per cubic yard.

2. Fly ash: ASTM C618 Class C or F. Volume and weight per cubic yard of fill. Provide minimum Fly ash content of 200 pounds per cubic yard.

3. Potable water: Volume and weight per cubic yard of fill. Amount of water determined by mix design testing.

4. Aggregate gradation: 100 percent passing the 3/8 inch sieve and not more than 10 percent passing the #200 sieve. The mix design report shall define a pilot gradation based on the following sieve sizes 3/8-inch, Nos. 4, 8, 16, 30, 50, 100 and 200. Do not deviate from the pilot gradation by more than +/-10 percentage points for any sieve for the production material.

5. Aggregate source material: Screened or crushed aggregate, pit or bank run fine gravels or sand, or crushed concrete. If crushed concrete is used, at least

6. 30 percent of natural aggregate shall be added as necessary to provide workability.

7. Admixtures: Use admixtures meeting ASTM C494 and ASTM C107 as needed to improve pumpability, to control time of set, and reduce bleeding.

8. Fluidifier: Use a fluidifier meeting ASTM C397 as necessary to hold the solid constituents in suspension. Add a shrinkage compensator if necessary.

9. Performance additive: Use a flowable fill performance additive, such as Darafill or approved equal, to control the fill properties.

B. Flowable Fill Requirements

1. Unconfined compressive strength: minimum 75 psi at 56 days as determined based on an average of three tests for the same placement. Present at least three acceptable strength tests for the proposed mix design in the mix design report.

2. Placement characteristics: self-leveling.

3. Shrinkage characteristics: non-shrink.

4. Water bleeding for fill to be placed by grouting method in sewers: not to exceed 2 percent according to ASTM C940.

5. Minimum wet density: 90 pounds per cubic foot.

2.02 BALLAST

A. Ballast material: natural rock or concrete pieces with a minimum size equal to at least 10 times the maximum aggregate size of the flowable fill and a maximum size of 24 inches. The maximum dimension shall not be more than 20 percent of the minimum dimension of the space to be filled.

B. Ballast composition: free of any regulated waste material.

2.03 PLUGS FOR FORCE MAINS

A. Grout Plugs: Cement-based dry-pack grout conforming to ASTM C1107, Grade B or C.

B. Manufactured Plug: Commercially available plug or cap specifically designed and manufactured to be used with the pipe being abandoned.

PART 3 - EXECUTION

3.01 PREPARATION

A. Have fill mix design reports and other submittals required by Paragraph 1.05 accepted by the OWNER's Representative prior to start of placement. Notify the OWNER's Representative at least 24 hours in advance of grouting with flowable fill.

B. Select fill placement equipment and follow procedures with sufficient safety and care to avoid damage to existing underground utilities and structures. Operate equipment at a pressure that will not distort or imperil any portion of the work, new or existing.

C. Clean sewer lines and video with closed circuit television to identify connections, locate obstructions, and assess the condition of the pipe. Locate previously unidentified connections, which have not been redirected and reconnected as a part of this project and report them to the OWNER's Representative. During placement of the fill, compensate for any irregularities in the sewer pipe, such as obstructions, open joints, or broken pipe to ensure no voids remain unfilled.

D. Perform demolition work prior to starting fill placement. Clean placement areas of sewers and manholes of debris that may hinder fill placement. Remove excessive amounts of sludge and any other substances that may degrade the performance of the fill. Do not leave sludge or other debris in place if filling more than 2 percent of the placement volume. Dispose of waste material in compliance with SECTION 01 50 00 – Temporary Facilities and Controls.

E. Remove free water prior to starting fill placement.

3.02 EQUIPMENT

A. Mix flowable fill in an automated batch plant and deliver it to the site in ready-mix trucks. Performance additives may be added at the placement site if required by mix design.

B. Use concrete or grout pumps capable of continuous delivery at the planned placement rate.

3.03 DEMOLITION OF ABANDONED SANITARY SEWER MANHOLES, PIPELINE STRUCTURES AND FORCE MAINS PRIOR TO ABANDONMENT

A. Remove manhole frames and covers and any castings from other existing pipeline structures. Deliver these castings to the OWNER's storage yard. Alternatively, salvaged castings may be used upon approval by the OWNER's Representative for construction of new manholes on this project.

B. Demolish and remove precast concrete adjustment rings and corner section, or brick and mortar corbel and chimney, or other pipeline structure, to a minimum depth of 4 feet below finished grade. The structure may be removed to a greater depth, but not deeper than 18 inches above the crown of the abandoned sewer.

C. If the adjacent sewer lines are not to be filled, place temporary plugs in each line connecting to the manhole in preparation for filling the manhole.

D. Excavate overburden from force mains to be abandoned at the locations indicated on the Drawings. Cut the existing force main, if necessary, to provide an end surface perpendicular to the axis of the pipe and suitable for the plug to be installed. Remove any force main piping material remaining outside of the segment to be abandoned.

3.04 INSTALLATION

A. Abandon sewer lines by completely filling the sewer line with flowable fill. Abandon manholes and other structures by filling with flowable fill, together with ballast as applicable, within the depth of structures left in place.

B. Place flowable fill to fill the volume between the manholes as completely as practicable. Continuously place flowable fill from manhole to manhole with no intermediate pour points, but not exceeding 500 feet in length.

C. Have the filling operation performed by experienced crews with equipment to monitor density of the flowable fill and to control pressure.

D. Temporarily plug sewer lines which are to remain in operation during pouring/pumping to keep the lines free of flowable fill.

E. Pump flowable fill through bulkheads constructed for placement of two 2-inch PVC pipes or use other suitable construction methods to contain the flowable fill in the lines to be abandoned. These pipes will act as injection points or vents for placement of flowable fill.

F. Place flowable fill under pressure flow conditions into a properly vented open system until flowable fill emerges from the vent pipes. Pump flowable fill with sufficient pressure to overcome friction and to fill the sewer from the downstream end, to discharge at the upstream end.

G. Inject flowable fill through replaced ballast using grouting equipment and a series of grout pipes discharging at the bottom of the placement, allowing the fill to rise through the ballast effectively filling all voids. Alternatively, sequentially place individual pieces of ballast at the same time as flowable fill is placed. Do not fill with ballast more than 50 percent of the volume at any level to prevent nesting and void formation.

H. Remediate placement of flowable fill which does not fill voids in a sewer, in manhole or other structures, or where voids develop due to excessive shrinkage or bleeding of the fill by using pressure grouting either from inside the sewer or from the surface.

I. Plug each end of force mains being abandoned.

J. Force main abandonment

1. Clean the inside surface of force mains at least 12 inches from the ends, as necessary, to achieve a firm bond and seal the grout plug or manufactured plug to the pipe surface. Similarly, clean and prepare the exterior pipe surface if a manufactured cap is to be used.

2. When using a grout plug, place a temporary plug or bulkhead approximately 12 inches inside the pipe. Fill the pipe end completely with dry-pack grout mixture.

3. When using a manufactured plug or cap, install the fitting, as recommended by the manufacturer's instructions, to form a watertight seal.

K. Backfill to the surface, above the pipe or structures left in place, with flowable fill in restricted areas, compacted bank run sand in unrestricted areas to be paved or select fill in unrestricted areas outside of pavement. Place and compact backfill, other than flowable fill, in compliance with these specifications.

L. Collect and dispose of excess flowable fill material and other debris in accordance with all sections of these specifications.

3.05 FIELD QUALITY CONTROL

A. Provide batch plant tickets for each truck delivery of flowable fill. Note on the tickets addition of admixtures at the site.

B. Check flow characteristics and workability of the fill as the placement proceeds.

C. Obtain at least three test cylinders for each placement area for determination of 56-day compressive strength and bleeding. The acceptance of the placement will be based on the average strength of the three tests.

D. Record the volume of ballast together with the flowable fill placement for the same space to demonstrate that voids have been filled.

3.06 PROTECTION OF PERSONS AND PROPERTY

A. Provide safe working conditions for employees throughout demolition and removal operations. Observe safety requirements for work below grade.

B. Maintain safe access to adjacent property and buildings. Do not obstruct roadways, sidewalks or passageways adjacent to the work.

END OF SECTION

SECTION 33 32 16.13
ABOVE GROUND PACKAGED UTILITY SEWERAGE PUMPING STATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes, but is not limited to, furnishing and installing a factory built duplex pump station as indicated on the project drawings, herein specified, as necessary for proper and complete performance.

1.02 REFERENCES

A. Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

B. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)

1. ANSI B16.1	Cast iron pipe flanges and flanged fittings.
2. ANSI/AWWA C115/A21.51	Cast/ductile iron pipe with threaded flanges.
3. ANSI 253.1	Safety Color Code for Marking Physical Hazards.
4. ANSI B40.1	Gages, Pressure and Vacuum.
5. AWWA C508	Single Swing Check Valves.

C. American Society for Testing and Materials (ASTM)

1. ASTM A48	Gray Iron Castings.
2. ASTM A126	Valves, Flanges, and Pipe Fittings.
3. ASTM A307	Carbon Steel Bolts and Studs.
4. ASTM A36	Structural Steel.

D. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE Std 100	Standard Dictionary of Electrical Terms.
2. IEEE Std 112	Test Procedure for Polyphase Induction Motors.
3. IEEE Std 242	Protection of Industrial and Control Power Systems.

E. National Electric Code (NEC) / National Electrical Manufacturers' Assoc. (NEMA)

1. NEC	National Electrical Code.
2. NEMA Std MG1	Motors and Generators.

F. Miscellaneous References

1. Ten-State Standards Recommended Standards for Sewage Works.
2. Hydraulic Institute Std for Centrifugal, Rotary and Reciprocating Pumps.
3. ISO 9001 International Organization for Standardization.

4. ISO 14001 International Organization for Standardization.

1.03 SYSTEM DESCRIPTION

A. Design requirements consist of factory built pump station design, including materials of construction, pump features, valves and piping, and motor controls shall be in accordance with requirements listed under PART 2 - PRODUCTS of this section.

1. Contractor shall furnish and install one factory built above ground, automatic pump station. The station shall be complete with all equipment specified herein, factory assembled in a fiberglass reinforced polyester resin enclosure.

2. In addition to the station enclosure, principle items of equipment shall include two vertical, vacuum-primed, centrifugal sewage pumps, motors, internal piping, valves, motor control panel, automatic liquid level control system, and internal wiring. Station manufacturer shall also be the manufacturer of the pumps, valves and control panel.

B. Performance Criteria

1. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 4" suction connection, and 4" discharge connection. Each pump shall be selected to perform under following operating conditions:

IFDC Lift Station:

a. Capacity (GPM) 150
b. Future Capacity (GPM) 400
c. Total Dynamic Head (FT) 208
d. Future Total Dynamic Head (FT) 215
e. Total Static Discharge Head (FT) 55
f. Horsepower (sized for future condition) 75
g. Nominal Motor Speed (RPM) 1800
h. Site Power 460/3/60

1.01 SUBMITTALS

A. Product Data

1. Prior to fabrication, pump station manufacturer shall submit 1 copy of submittal data for review and approval.

2. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, motor data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), net positive suction head required (NPSHr), and hydraulic brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.

B. Shop Drawings

1. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for station. Pipe penetrations and station access clearances shall be dimensioned relative to the station centerline. The electrical ladder logic drawings shall illustrate motor branch and liquid level control circuits to extent necessary to validate function and integration of circuits to form a complete working system.

C. Operations and Maintenance Manuals

1. Operation shall be in accordance with written instructions provided by the pump station manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.

2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:

a) Functional description of each major component, complete with operating instructions.

b) Instructions for operating pumps and pump controls in all modes of operation.

c) Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.

d) Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.

e) Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA 70. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

f) Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.

g) Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to

selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

1.02 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. The pumps must be ISO 9001:2015 revision certified, with scope of registration including design control and service after sales activities.

2. The pumps and pump station manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.

3. Upon request from the engineer, the pump station manufacturer shall prove financial stability and ability to produce the station within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.

4. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. "Reverse-engineered" products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.

5. The term "pump manufacturer" or "pump station manufacturer" shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a "pump manufacturer" or "pump station manufacturer" and is not an acceptable supplier. For quality control reasons and future pump and parts availability, all major castings of the pump shall be sourced and machined in North America.

B. Pump Performance Certifications

1. Solids Handling Capability

a) All internal passages, impeller vanes, and recirculation ports shall pass a minimum 3" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the engineer, manufacturer's certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

C. Factory System Test

1. All internal components including the pumps, motors, valves, piping and controls will be tested as a complete working system at the manufacturer's facility. Tests shall be conducted in accordance with Hydraulic Institute Standards at the specified head, capacity, rated speed and horsepower. Factory operational test shall simulate actual performance anticipated for the complete station.

D. Manufacturer's Start-up Services

1. The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.03 MANUFACTURER'S WARRANTY

A. The equipment supplier shall warrant that its equipment shall be free from defects in material and workmanship; and that it will replace or repair any part or parts returned to it which examination shall show to have failed under normal use and service by the user within twelve (12) months following operation start-up.

PART 2 – PRODUCT

2.01 PRODUCTS

A. The pumps at the IFDC Lift Station are based on centrifugal, solids-handling, vertical, vacuum-primed, package wastewater pump stations, and the Contract Documents have been prepared using this configuration as the Basis of Design. The Basis of Design manufacturer and model is Smith & Loveless EverLast 5000 Series. CONTRACTOR may provide a package station by Smith & Loveless, or ENGINEER-approved equal meeting the vertical, vacuum-primed pump design requirements of this Section. Pumps shall be capable of passing a minimum 3-inch spherical solid, with materials, motor cooling, sealing system, and manufacturer support equal to or better than the specified model.

B. Acceptable Manufacturers & Models:

1. Smith & Loveless EverLast 5000 Series (Basis of Design)

2. Or ENGINEER-approved equal wastewater package pumping station meeting the requirements of this Section

C. CONTRACTOR shall be solely responsible for all costs associated with design modifications, structural revisions, wet well or valve vault modifications, electrical changes, site adjustments, hydraulic recalculations, and any other changes required to accommodate an approved equal or substituted pump station. No additional compensation shall be provided for engineering, redesign, coordination, or construction impacts resulting from selection of equipment other than the Basis of Design.

2.02 MANUFACTURER

A. The pump station system integrator must be ISO 9001:2015 revision certified, with scope of registration including design control and service after sales activities.

B. The specifications and project drawings depict equipment and materials manufactured by Smith & Loveless, Inc. which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

C. After execution of the contract, the contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be superior in construction and performance to that specified in the contract, and the higher quality must be demonstrated by a list of current users of the proposed equipment in similar installations.

D. In event the contractor obtains engineer's approval for equipment substitution, the contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the engineer prior to acceptance.

E. It will be assumed that if the cost to the contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.

2.03 STATION ENCLOSURE

A. The station shall be constructed as one complete, factory-built assembly sized to rest atop the wet well as detailed on the contract drawings. Pump components and station piping, including suction pipe connections, shall be removable without entering the wet well. Suction and discharge connections passing through the station floor shall be sealed by gaskets, not welded, to allow adjustment and replacement. Enclosure shall incorporate the following design and service features:

B. The pump station shall be enclosed by a two-piece hinged fiberglass cover with a drip-lip around the edge, provided with means to lock the pump chamber with a padlock. Each cover half shall be attached with a multi-segment stainless steel hinge, constructed of 7-gauge (minimum) type 304 stainless steel with a 3/8" diameter stainless steel pin, supporting at least 75% of the width of one end, and anchored with stainless steel bolts having tamperproof heads and a full-width 3/8" thick anodized aluminum backing plate.

1. Dual high-pressure gas struts shall be provided to counteract the dead weight of each cover assembly and limit the maximum lifting force required for opening to less than 20 pounds. The cover shall be self-latching upon opening, with a manually operated release for closing. Duplex heavy gauge safety chains shall be provided to prevent over-extension. All hardware and components of the cover assembly exposed to weather shall be constructed of corrosion resistant materials.

2. A two-piece manway cover of 1/4" aluminum treadplate, with stainless steel piano hinges and hardware, located exterior to the fiberglass pump chamber, shall be provided complete with padlocking provisions to facilitate visual checking of float switch settings and access to the wet well. The minimum open area of the manway access shall be at least 4.2 square feet. The manway cover shall have a three-color, minimum 7" x 10" corrosion-resistant sign permanently affixed reading "DANGER - Before Entering, Test For Explosive Atmosphere. Test For Oxygen Deficiency. Supply Fresh Air To Work Area." Manway cover sections shall be secured with tamperproof fasteners to prevent unauthorized removal.

3. A stanchion with lifting arm shall be provided to lift each pump, with a hook over the center of the motor to support a hoist (provided by others) for removal of motors, impellers, and pumps from the station. Enclosures utilized to house the valve train and/or controls that are defined under OSHA Article 29 CFR, Part 1910 as a Confined Space shall not be acceptable.

C. The station base shall be a factory-built steel floor plate on which the pump casings and discharge piping are mounted, sized to rest atop the wet well as detailed on the contract drawings. The supporting floor plate shall be minimum 1" thick carbon steel, reinforced as required to prevent deflection and ensure a rigid support, meeting ASTM A-36, or, where specified, minimum 1/2" corrosion-resistant lean duplex stainless steel (316L or equal, PREN 24.0 or greater), warranted by the manufacturer for twenty-five years against structural failure and perforation due to corrosion. All structural steel and cast iron surfaces shall be factory blasted to SSPC-SP6, coated with a minimum 6 mil dry film thickness cycloaliphatic amine epoxy primer and a minimum 2.5 mil dry film thickness aliphatic acrylic polyurethane topcoat. The suction and discharge connections, where they pass through the floor, shall be sealed by gaskets, not welded, to allow future adjustment and replacement.

D. A ventilating blower capable of delivering not less than 650 CFM shall be provided to remove heat generated by continuous motor operation, turned on and off automatically by the station controller. Blower motor shall energize automatically at approximately 70 degrees F, and turn off at 55 degrees F. The blower motor control circuit shall incorporate a thermal-magnetic circuit breaker providing overcurrent and overload protection. Exhaust and inlet locations shall prevent the entrance of rain, snow, or debris.

E. Station Heater

1. Pump station shall be provided with a minimum 500 watt, 115 volt electric heater, controlled by the station controller and rigidly mounted to prevent removal. Ungrounded heaters shall not be acceptable.

2.04 PUMP DESIGN

A. Pumps shall be vertical, centrifugal, non-clog type, of heavy cast-iron construction, especially designed for the use of mechanical seals and vacuum priming, with an enclosed, two-port impeller of close-grained cast iron. The motor shaft shall be directly connected to the impeller without the use of drive belts or couplings. Self-priming pumps requiring

suction check valves or air vent piping to reprime are not an acceptable substitute. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.

Basis of Design Pump Construction (Vertical, Vacuum-Primed): The shaft bearing nearest the impeller shall be locked in place so end play is limited to bearing clearance, and the shaft from the top of the impeller to the lower bearing shall be sized per the pump manufacturer's standard for the motor frame furnished. The shaft shall be solid stainless steel through the mechanical seal. The pump shall have an integral adapter providing a water reservoir above the impeller for positive exclusion of air and lubrication of the seal; hollow priming adapters are required, and self-priming pumps are not an acceptable substitute. Priming shall occur from the lower pressure area behind the impeller, not from high-pressure connections, with all liquid-carrying priming passages at least 2-1/2" equivalent opening and a transparent priming bowl for visual monitoring. The pump shaft seal shall be a single mechanical seal of carbon and ceramic construction, lapped to one light band flatness, held in a bronze seal housing, automatically drained and re-primed with the pump to prevent freeze damage during power outages. Motors shall be vertical, solid shaft, NEMA P-base, squirrel-cage induction type, NEMA Design B, Class F insulation (Class B temperature rise), 1.15 service factor, and fitted with lifting eyes rated for the full weight of the pump and motor. A vacuum priming system shall be furnished with two vacuum pumps (100 percent standby), vacuum control solenoid valves, a prime-detection level sensor of the type described in Section 2.09, float-operated check valves with transparent bodies to protect the vacuum pumps, and all shutoff valves shown on the piping schematic, with vacuum pump discharge air piped to the wet well.

B. The pump manufacturer must be ISO 9001:2015 revision certified, with scope of registration including design control and service after sales activities.

C. Serviceability

1. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs.

2. No special tools shall be required for replacement of any components within the pump.

D. Spare Parts Kit:

1. The following minimum spare parts shall be furnished with the pump station:

a) One pump mechanical seal
b) One set of vacuum priming system solenoid valve seals
c) One WaveStart™ (or equivalent) prime-sensing probe
d) One set of float-operated check valves for the vacuum priming system

2.05 VALVES AND PIPING

A. Check Valve: Each pump discharge line shall be equipped with a clapper-type check valve of the spring-loaded type, capable of passing a 3" spherical solid, with an external lever arm

and torsional spring, and a resilient or replaceable stainless-steel seat sealed for reliable shutoff against vacuum and backflow. Valve body shall be cast iron with a clean-out port sized to allow removal and/or replacement of the clapper and seat without removing the valve or piping from the line. The valve clapper seating surface, hinge pin, and shaft shall be of corrosion-resistant construction (stainless steel shaft with bronze or brass bushings), with all wetted hardware corrosion resistant. Valve shall be rated for not less than 175 PSI water working pressure. Ball-type check valves, and valves other than full-flow clapper type, or valves mounted in such a manner that prevents the passage of a 3" spherical solid, shall not be acceptable.

B. Plug Valve: Each station shall be equipped with an isolation valve arrangement that allows either or both pumps to be isolated from the common force main. This may be accomplished via a single 3-way tapered plug valve or individual non-lubricated plug valves. All valves shall feature high-quality cast-iron bodies and corrosion-resistant seats (such as welded nickel). For 3-way tapered designs, the actuator shall provide lift, turn, and reseat action. For individual valves, each pump discharge line must be independently isolatable. One operating handle/lever shall be provided for each valve type as required.

C. Gauge Kit

1. A protected, liquid-filled compound vacuum/pressure gauge shall be provided for each pump, minimum 4" diameter with 3-1/2" dial, fitted with a brass stop valve and manual air relief valve, mounted apart from the pumps on a bracket attached to the control panel support structure, and connected to the pump discharge taps by flexible tubing to minimize vibration. The range of each gauge shall be selected to place the normal operating discharge pressure reading in the middle one-third of the scale, and the gauge shall also be capable of measuring up to 30" HG of vacuum. The gauge shall have a Zytel Nylon case with blow-out plug, stainless steel bezel, acrylic lens, and phosphorus bronze Bourdon tube with brass socket, temperature-compensated, and protected from the process fluid by an internal isolating diaphragm. Rated accuracy shall be 1% of full scale reading.

2. Gauges to be factory mounted on a resilient panel with frame assembly secured to pumps or piping. Gauge installations shall be complete with all hoses and stainless steel fittings, including a shutoff valve for each gauge line at the point of connection to suction and discharge pipes.

D. Discharge Pressure Transmitters

1. In addition to the local gauges specified above, two (2) 4-20 mA discharge pressure transmitters shall be provided, one per pump, to monitor individual pump discharge pressure for SCADA. Each transmitter shall be isolated from the process by a minimum 2" isolation valve and isolation seal; smaller valves or seals shall not be acceptable due to wastewater solids content. Each transmitter output signal shall be wired to the station control panel and made available at the terminal strip for connection to the Utility-supplied SCADA panel described in Section 2.09.

E. Piping

1. Flanged header pipe shall be centrifugally cast, ductile iron, complying with ANSI/AWWA A21.51/C115 and class 53 thickness.

2. Flanges shall be cast iron class 125 and Comply with ANSI B16.1.

3. Pipe and flanges shall be threaded and suitable thread sealant applied before assembling flange to pipe.

4. Bolt holes shall be in angular alignment within 1/2 degree between flanges. Flanges shall be faced with a gasket finish having concentric grooves a minimum of 0.01 inch deep by approximately 0.03 inch wide, with a minimum of three grooves on any given surface spaced a maximum of 1/4 inch apart.

F. Supports and Thrust Blocks: Contractor must ensure all pipes connected to the pump station are supported to prevent piping loads from being transmitted to pumps or station piping. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract drawings.

2.06 DRIVE UNIT

A. Motors

1. Pump motors shall be vertical, solid shaft, NEMA P-base, squirrel-cage induction type, of the HP indicated in 1.03.B.1, suitable for the phase, cycle, and voltage of the utility power specified in Part 1 of this section, with forced air circulation by an integral fan, leads terminated in a cast connection box, Class F insulation (Class B temperature rise), NEMA Design B starting torque and current characteristics, and 1.15 service factor reserved for the owner's protection. The motor-pump shaft shall be centered relative to the motor base within .005", with shaft runout not to exceed .003". A bearing cap shall hold the bottom motor bearing in a fixed position, with bearing housings fitted for lubrication and purging of old lubricant. The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor. The motors shall not overload at the design condition or at any head in the operating range as specified.

2. Motors shall be tested in accordance with provisions of ANSI/IEEE Std. 112, Method B.

2.07 FINISH

A. Pumps, piping, and exposed structural steel and cast iron framework shall be factory blasted with steel grit in an environmentally controlled booth to remove rust, mill scale, and weld slag, with all weld spatter and surface roughness removed by grinding, to a surface profile of 2.0 mils in accordance with SSPC-SP6; sandblasting is prohibited. Immediately following cleaning, all such surfaces shall receive a minimum 6 mil dry film thickness coating of a cycloaliphatic amine epoxy primer, followed after curing by a minimum 2.5 mil dry film thickness topcoat of aliphatic acrylic polyurethane for abrasion resistance and weather protection, consistent with the coating system specified for the station base in Section 2.03. Stainless steel, aluminum, and other corrosion-resistant surfaces shall not be coated;

unprotected carbon steel surfaces shall be coated with a suitable non-hardening rust preventative compound. Finish coating shall be completed prior to shipment from the factory. A touch-up kit with detailed instructions shall be provided by the pump station manufacturer for repair of mars or scratches occurring during shipping and installation.

2.08 ELECTRICAL CONTROL COMPONENTS

A. The pump station control panel will be tested as an integral unit by the pump station manufacturer. The control panel shall also be tested with the pump station as a complete working system at the pump station manufacturer's facility.

B. Panel Enclosure

1. Electrical control equipment shall be mounted within a common NEMA 4X stainless steel enclosure with two hinged, lockable doors and a steel barrier partition separating three-phase power circuits from single-phase control circuits and low-voltage components; the microprocessor and low-voltage controls shall be accessible, and the controller operable, without exposing the three-phase supply. The panel shall be supported on adjustable, extruded aluminum mounting legs secured to the station baseplate. Control components shall be mounted on removable steel back panels secured to the enclosure with collar studs, and all components shall be UL listed or recognized, with the complete panel labeled as a UL 508A General Use Industrial Control Panel.

2. All control devices and instruments shall be secured to the sub-plate with machine screws and lockwashers. Mounting holes shall be drilled and tapped; self-tapping screws shall not be used to mount and component. All control devices shall be clearly labeled to indicate function.

C. Branch Components

1. All motor branch and power circuit components shall be of highest industrial quality. The short circuit current rating of all power circuit devices shall be a tested combination or evaluated per the National Electrical Code Article 409. the lowest rated power circuit component shall be the overall control panel short circuit rating and shall not be less than the fault current available. The minimum control panel rating shall not be less than 10 kA, rms symmetrical for the IFDC Lift Station. Control assemblies operating at 120 volts nominal or less may be provided with transformers which limit the fault current and may be rated less than the minimum required short circuit rating.

2. Circuit Breakers and Operating Mechanisms

a) Either provide main breaker within each control panel, or provide a panel designed with bussing/etc. that is properly-rated to be protected by the upstream feeder fuses/breaker specified (see electrical plans and coordinate with submittals from electrical subcontractor).

b) A properly sized heavy duty circuit breaker shall be furnished for each pump motor. The circuit breakers must be sealed by the manufacturer after calibration to prevent tampering.

c) An operating mechanism installed on each motor circuit breaker shall penetrate the control panel door. A padlockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

3. Motor Controllers (Adjustable Frequency Drives)

a) Each pump motor shall be controlled by a dedicated adjustable frequency drive (VFD), mounted external to the main control panel or segregated within it to reduce the danger of power-off servicing while the remainder of the control system is in operation. The VFD shall be a completely solid-state, PWM (pulse width modulation) type converter, transforming the site power specified in Part 1 of this section into variable voltage, adjustable frequency, 3-phase output of suitable capacity to control the speed of a NEMA Design B AC motor throughout a step-less speed range under variable torque load on a continuous basis, capable of operating the motor continuously at 100% of rated speed. The VFD shall accept a speed signal from the liquid level control system in automatic mode, or a programmable preset speed in manual mode, with a linear acceleration/deceleration time ramp adjustable from 0 to 1800 seconds. Replaceable fuses shall be provided for short circuit protection of each VFD, and a disconnect switch shall be provided to remove each VFD from all power. Two adjustable "skip bands" shall be provided to prevent pump operation at resonant frequencies. Motor circuit protectors with lockout capability, matched to motor inrush current, shall be provided for each pump motor; thermal magnetic circuit breakers shall not be used for pump motor service.

4. Overload Relays

a) Overload relays shall be solid-state block type, having visual trip indication with trip-free operation. Electrically resetting the overload will cause one (1) normally open and one (1) normally closed isolated alarm/control contact to reset, thus re-establishing a control circuit. Trip setting shall be governed by solid-state circuitry and adjustable current setting. Trip classes shall be 10, 15 and 20. Additional features to include phase loss protection, selectable jam/stall protection and selectable ground fault protection.

b) A reset pushbutton, mounted through the control panel door, shall permit resetting the overload relays without opening the door.

5. Phase Monitor

a) The control panel shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage

caused by phase reversal, phase loss, voltage unbalance, high voltage, and low voltage. An adjustable time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart, following an adjustable time delay, when power conditions return to normal.

6. Transient Voltage Surge Suppressor

   a) The control panel shall be equipped with a modular surge arrestor to minimize damage to the pump motors and control from transient voltage surges. The suppressor shall utilize thermally protected by heavy duty zinc-oxide varistors encapsulated in a non-conductive housing. Mechanical indicators shall be provided on each phase to indicate protection has been lost. The suppressor shall have a short circuit current rating of 200,000 Amps and a Maximum Discharge current rating [I_{max}] of 40,000 Amperes. Nominal discharge current [I_n] is 20,000 Amperes. Surge arrester according to UL 1449 3rd Edition,Type 2 component assembly.

7. Voltage Alert Indication

   a) The control panel shall include a voltage alert indicator to reduce the risk of electrical arc flash by pre-verifying the electrical isolation from outside of the control panel. Hardwired to the main incoming point of termination, the indicator shall be powered by the same voltage that it indicates utilizing redundant circuitry, thereby flashing whenever voltage is present. An eight detector display shall visually alert the presence of dangerous AC or DC potentials occurring between any combination of the monitored input lines.

D. Control Circuit

1. A normal duty thermal-magnetic circuit breaker shall protect all control circuits by interrupting control power.

2. Pump mode selector switches shall permit manual start or stop of each pump individually, or permit automatic operation under control of the liquid level control system. Manual operation shall override all shutdown systems, except the motor overload relays. Selector switches to be oil-tight design with contacts rated NEMA A300 minimum.

3. Pump alternation shall be integral to the liquid level controller. Provisions for automatic alternation or manual selection shall also be integral to the liquid level controller.

4. Six digit elapsed time meter shall be displayed on the QuickSmart™ PLC controller operator interface to indicate total running time of each pump in "hours" and "tenths of hours". Pump runtime shall be adjustable and password protected.

5. A high pump temperature protection circuit shall override the level control and shut down the pump motor(s) when required to protect the pump from excessive temperature. A thermostat shall be mounted on each pump casing and connected to

the QuickSmart™ PLC controller. If casing temperature rises to a level sufficient to cause damage, the thermostat causes the QuickSmart™ PLC controller to interrupt power to the motor. The QuickSmart™ PLC controller will display an alarm banner indicating the motor stopped due to high pump temperature. The motor shall remain locked out until the pump has cooled and circuit has been manually reset. Automatic reset of this circuit is not acceptable.

6. A duplex ground fault receptacle providing 115 VAC, 60 Hz, single phase current, will be mounted on the side of the control enclosure. Receptacle circuit shall be protected by a 15 ampere thermal-magnetic circuit breaker.

7. Auxiliary Power Transformer

   a) The lift station shall be equipped with a 3 KVA (minimum) step-down transformer to supply 115 volt, AC, single phase for the control and auxiliary equipment. See electrical plans for additional requirements for 115V branch circuit breakers. The primary and secondary side of the transformer to be protected by a thermal magnetic circuit breaker, sized to meet the power requirements of the transformer. An operating mechanism shall penetrate the control panel door and a padlockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

8. Wiring

   a) The pump station, as furnished by the manufacturer, shall be completely wired, except for power feed lines to the branch circuit breakers and final connections to remote alarm devices.

   b) All wiring, workmanship, and schematic wiring diagrams shall comply with applicable standards and specifications of the National Electric Code (NEC).

   c) All user serviceable wiring shall be type MTW or THW, 600 volts, color coded as follows:

      1) Line and Load Circuits, AC or DC power.....Black
      2) AC Control Circuit Less Than Line Voltage.....Red
      3) DC Control Circuit..... Blue
      4) Interlock Control Circuit, from External Source.....Yellow
      5) Equipment Grounding Conductor.....Green
      6) Current Carrying Ground..... White
      7) Hot With Circuit Breaker Open.....Orange

   d) Control circuit wiring inside the panel, with exception of internal wiring of individual components, shall be 16 gauge minimum, type MTW or THW, 600 volts. Power wiring to be 14 gauge minimum. Motor branch wiring shall be 10 gauge minimum.

e) Motor branch and other power conductors shall not be loaded above the temperature rating of the connected termination. Wires must be clearly numbered at each end in conformance with applicable standards. All wire connectors in the control panel shall be ring tongue type with nylon insulated shanks. All wires on the sub-plate shall be bundled and tied. All wires extending from components mounted on door shall terminate at a terminal block mounted on the back panel. All wiring outside the panel shall be routed through conduit.

f) Control wires connected to door mounted components must be tied and bundled in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall allow the door to swing full open without undue stress or abrasion. Bundles shall be held on each side of hinge by mechanical fastening devices.

9. Conduit

a) Factory installed conduit shall conform to following requirements:

1) All conduit and fittings to be UL listed.
2) Liquid tight flexible metal conduit to be constructed of smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight polyvinyl chloride cover.
3) Conduit to be supported in accordance with articles 346, 347, and 350 of the National Electric Code.
4) Conduit shall be sized according to the National Electric Code.

10. Grounding

a) Station manufacturer shall ground all electrical equipment inside the pump station to the control panel back plate. All paint must be removed from the grounding mounting surface before making final connection.

b) The contractor shall provide an earth driven ground connection to the pump station at the main grounding lug in accordance with the National Electric Code (NEC).

11. Equipment Marking

a) Permanent corrosion resistant name plate(s) shall be attached to the control and include following informafffftion:

1) Equipment serial number
2) Control panel short circuit rating
3) Supply voltage, phase and frequency
4) Current rating of the minimum main conductor
5) Electrical wiring diagram number
6) Motor horsepower and full load current
7) Motor overload heater element
8) Motor circuit breaker trip current rating
9) Name and location of equipment manufacturer

b) Control components shall be permanently marked using the same identification keys shown on the electrical diagram. Labels shall be mounted adjacent to device being identified.

c) Switches, indicators, and instruments mounted through the control panel door shall be labeled to indicate function, position, etc. Labels shall be mounted adjacent to, or above the device.

2.09 LIQUID LEVEL CONTROL

A. The level control system shall start and stop the two pump motors in response to changes in wet well level, as set forth herein, using the QuickSmart™ PLC controller and submersible transducer described below and in Article 8 of this Section. Level control systems requiring an air bubbler tube, ultrasonic transmitter, or a triplex (three-pump) alternation scheme are not applicable to this duplex, vacuum-primed station and are not acceptable.

B. The controller shall continuously monitor the wet well level and permit the operator to read the level at any time. On automatic operation, the controller shall start the lead pump when the liquid level reaches the lead pump start level, and stop it at the lead pump stop level. Should the wet well level continue to rise, the controller shall start the lag pump at the lag pump start level so that both pumps operate together. All levels shall be field-adjustable through the operator interface without the use of external test equipment or artificial level simulation.

C. Pump alternation, high- and low-level alarms, elapsed run-time indication, and all other liquid-level control functions shall be provided by the QuickSmart™ PLC controller and associated submersible transducer specified in Article 8 of this Section, rather than by a separate electronic pressure switch or level control module.

D. Submersible Transducer System

1. The level control system shall utilize a submersible transducer. It shall be a strain gauge transducer with a pressure sensor housed in a 316 SST or Titanium case designed to extend into the wet well. The pressure transducer shall provide a proportional signal for distribution to the display and electronic comparators of the electronic pressure switch, and remainder of the level control system. Sensor range shall be 0-12 ft. W.C. minimum with an over-pressure rating 3 times full scale. The transducer shall have output capability of 1.5-7.5VDC or 4-20mA. The transducer's polyurethane jacketed shielded cable shall be of suitable length for proper installation into the wet well without splicing.

2. An intrinsically safe repeater shall be supplied in the control enclosure. Repeater must be recognized and listed as intrinsically safe by a nationally recognized testing laboratory. Station manufacturer shall make all connections from repeater to feeder lines and motor controls. Installing contractor shall make connections from repeater to transducer.

H. A four float backup option shall be provided. This option will allow the system to run both pumps in the event of a primary controller failure. In the event that the lead level float is tipped, the controls will call the lead pump to run, upon the water level reaching the lag level float, the controls will call the lag pump to run. Both pumps will run until the off float is

reached. This will continue until the failure of the primary controller is addressed. This backup float option shall utilize hardwired relays and a separate pump alternator (rather than the primary controller) to control the pumps in the event of failure of the primary controller or level transducer. Provide intrinsically-safe relaying/barriers/separating for all wetwell float switch connections. Float switches shall be self-weighted, mercury-free float switches of the Anchor Scientific "Roto-Float" type, or approved equal, as required by application, supported by ¼" type 304 stainless steel cable support with PVC-coated 15-pound anchor, installed per manufacturer's recommendations.

I. Should the water level rise to the "high water alarm" level, the high level alarm float switch shall energize a 115-volt AC circuit for the external alarm light indicated below. An indicator, visible from front of control panel, shall indicate high level condition exists. The alarm signal shall maintain until wet well level is lowered and alarm circuit manually reset.

E. Alarm Light (External)

1. Station manufacturer will supply one 115 VAC alarm light fixture with vapor-tight shatter resistant red globe, conduit box, and mounting base. The design must prevent rain water from collecting in the gasketed area of the fixture, between the base and globe. The alarm light will be shipped loose for installation by the contractor.

F. CONTRACTOR may propose alternate level control devices, including alternate models or configurations of the specified level transducer and float controls, provided such alternates perform inherently the same functions and serve the same operational purpose as those specified herein. Any proposed alternates shall maintain full functionality as described in this Section and shall be submitted in writing to the ENGINEER for review and approval prior to procurement, fabrication, or installation. Alternates not disclosed and approved in advance shall be considered non-conforming, and the CONTRACTOR shall be solely responsible for all costs, modifications, delays, or corrective work required to achieve full compliance with the Contract Documents.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacturer shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

A. Install, level, align, and lubricate pump station as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

B. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

E. After all anchor bolts, piping and control connections are installed, completely fill the grout dam in the pump station base with non-shrink grout.

3.03 FIELD QUALITY CONTROL

A. Operational Test

1. Prior to acceptance by owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.

2. After construction debris and foreign material has been removed form the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

B. Manufacturer's Start-up Services

1. Coordinate station start-up with manufacturer's technical representative. The representative or factory service technician will inspect the completed installation. He will calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.04 CLEANING

A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

3.05 PROTECTION

A. The pump station should be placed into service immediately. If operation is delayed, drain water from pumps and piping. Open motor circuit breakers and protect station controls and interior equipment from cold and moisture. Station is to be stored and maintained per manufacturer's written instructions.

END OF SECTION