

CONTRACT NO. 1

SYSTEM IMPROVEMENTS PROJECT

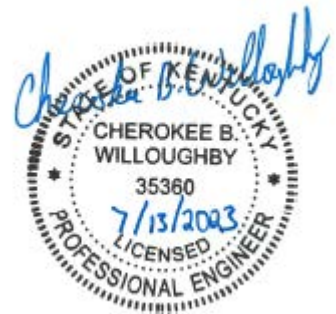
**CONTRACT DOCUMENTS AND
SPECIFICATIONS**

FOR THE

**WESTERN MASON WATER
DISTRICT**

BID DATE: APRIL 10, 2024
JOB #: 21015

PREPARED BY:



222 East Main Street, Ste. 1 • Georgetown, KY 40324

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DIVISION 00

**PROCUREMENT AND CONTRACTING
REQUIREMENTS**

SECTION 001113

ADVERTISEMENT

Sealed bids for the **Western Mason Water District System Improvements Project, Contract 1 – Water Main Replacement and Booster Pump Station and Contract 2 – Water Meter Replacement** for the Western Mason Water District, will be received at the District office located at 2573 Mary Ingles Highway, Dover, Kentucky 41034 until 11:00 **a.m.**, Local Time, **April 10, 2024** and then publicly opened and read aloud.

The program of work for Contract No. 1 which bids are to be submitted consists of the installation of approximately 26,000 LF of 6", 3" and 2" water main and appurtenances and replacement of one booster pump station. Contract No. 2 which bids are to be submitted consists of the installation and replacement of approximately 825 meters with new radio read meter system, and other appurtenances.

The work is located in Mason and Bracken County, Kentucky: Drawings, Specifications and Contract Documents may be examined at:

Bluegrass Engineering, PLLC, 222 East Main Street, Suite 1, Georgetown, Kentucky 40324
Phone: 859-351-1714

Western Mason Water District, 2573 Mary Ingles Highway, Dover, Kentucky 41034
Phone: 606-882-3141

Copies of the Drawings, in full size and the Specifications and Contract Documents may be obtained from Bluegrass Engineering, PLLC, 222 East Main Street, Suite 1, Georgetown, Kentucky 40324, Phone 859-351-1714, upon receipt of a non-refundable amount of \$200.00 for each Contract complete set of documents for a hard copy. **All qualified bidders must purchase a set of plans and specifications and must be listed as a plan holder by the plan distributor, Bluegrass Engineering, PLLC.**

All bids must be made on the required Bid Form and must be fully completed and executed with original signatures and corporate seals.

The contract is being funded by the Kentucky Rural Water Finance Corporation.

State Prevailing Wage Rates DO NOT apply for this project.

Hearing impaired individuals may call 1-800-247-2510 for information.

No Bidder may withdraw his Bid within ninety (90) days after the actual date of bid opening.

Bidders on this work will be required to comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours Standard Act. Bidders must comply with the President's Executive Orders No. 11246 and No. 11375 and any amendments or supplements to those Executive Orders.

Attention of bidders is particularly called to the requirements as to conditions of employment to be observed under the contract, Section 3, Segregated Facility, Section 109 and E.O. 11246.

Bidders must certify they do not and will not maintain or provide for their employees any facilities that are segregated or based on race, color, creed, or national origin.

Minorities and small businesses are encouraged to submit bids on this project.

The Western Mason Water District reserves the right to waive any bidding informalities and to reject any or all bids, for any reason deemed advisable by the District. The right is reserved by the Owner, in the exercise of its sole judgment to reject any or all Bids, and to re-advertise and award the Contract in the regular manner or to waive any informalities, irregularities, mistakes, errors, or omissions in any Bid received and to accept any Bid deemed to be responsive to this invitation and favorable to interests of the Owner.

The Contract will be awarded on the basis of the low evaluated responsive, responsible, best and qualified bidder unless all bids are rejected.

The sealed bid for this project shall be clearly marked on the outside of the envelope: "Sealed Bid for **Western Mason Water District System Improvements Project, Contract No. 1 and/or Contract No. 2** for the Western Mason Water District, 2573 Mary Ingles Highway, Dover, Kentucky 41034. If Bids are to be mailed, they should be mailed to: Western Mason Water District, P.O. Box 49, Dover, Kentucky 41034. Phone 606-882-3141. A certified check or Bid Bond payable to the Western Mason Water District in the amount of five (5) percent of the Bid shall accompany the Bid.

WESTERN MASON WATER DISTRICT

Larry Redden, Chairman

Advertisement Date: March 30, 2024

INSTRUCTIONS FOR PROCUREMENT

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

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

Prepared by



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ARTICLE 1 – DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. The term "Bidder" means one who submits a Bid directly to Owner, as distinct from a subbidder, who submits a bid to a Bidder. The term "Successful Bidder" means the lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents must be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid. Bids from anyone not on the Engineer's Plan Holders List will not be opened.
- 2.02 Complete sets of Bidding Documents shall 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 authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its Bid written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and the additional information listed in the Bid Form.
- 3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.
- 3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

- 4.01 *Site and Other Areas*
- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.
- 4.02 *Existing Site Conditions*
- A. Subsurface and Physical Conditions; Hazardous Environmental Conditions
1. If there are reports and/or additional information concerning site conditions available, they will be included as Appendices to the Bidding Documents.

2. Geotechnical Report: If a Geotechnical Report is available, it will be included as an appendix to the Bidding Documents. The Geotechnical Report describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations.

The Conditions in the Geotechnical Report are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on the said Conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the Report, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are reported.

Nothing in the report is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.

- B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.
- C. Adequacy of Data: 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 subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 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 5.06 of the General Conditions.

4.03 *Site Visit and Testing by Bidders*

- A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.
- B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.
- D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

- E. 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.

4.04 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.05 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 – BIDDER'S REPRESENTATIONS

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

- A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;
- B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Bidding Documents, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Bidding Documents, especially with respect to Technical Data in such reports and drawings;
- E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;
- F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, 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. 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;
- I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and
- J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

6.01 No pre-bid conference is scheduled for this project.

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 via email to preynolds@bluegrassengineering.net. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven 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, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five (5) percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and 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 released. 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 consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that 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 Contract or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released 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 substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages, if any, for failure to timely attain Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Supplemental General Conditions and referred to in the Agreement.

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

- 11.01 The Contract for the Work, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids in the case of a proposed substitute and 15 days prior in the case of a proposed “or-equal”. Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner. Substitutes and “or-equal” materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.04 and 7.05 of the General conditions after the Effective Date of the contract.
- 11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.
- 11.03 If an award is made, Contractor shall be allowed to submit proposed substitutes and “or-equals” in accordance with the General Conditions.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 12.01 If required by the bid documents, the Bidder shall submit to Owner a list of the Subcontractors or Suppliers proposed for the major portions of the Work. If requested by Owner, 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, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute.
- 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, or other individuals or entities. Declining to make requested substitutions will 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 subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

- 12.03 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.
- 12.04 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SGC 7.06.

ARTICLE 13 – PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
- B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words “No Bid” or “Not Applicable.”
- 13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.
- 13.03 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.04 A Bid by an individual shall show the Bidder’s name and official address.
- 13.05 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.06 All names shall be printed in ink below the signatures.
- 13.07 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.08 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.09 The Bid shall contain evidence of Bidder’s authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder’s state contractor license number, if any, shall also be shown on the Bid Form. 11.8. The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of any cash allowances named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.
- The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of any cash allowances named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.
- 13.10 Each Bid must be submitted on the prescribed form and accompanied by the submittals listed in the Bid Form.

ARTICLE 14 – BASIS OF BID

- 14.01 Unit Price Bid

- A. Bidders shall submit a Bid on the basis as set forth in the Bid Form.

ARTICLE 15 – SUBMITTAL OF BID

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.
- 15.02 A Bid shall be received 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 a plainly marked package 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, 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 package plainly marked on the outside with the notation "BID ENCLOSED."
- 15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be withdrawn by an appropriate document duly executed in the same 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. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 16.03 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, 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 – EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that

Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

- 19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.
- 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 whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20 – BONDS AND INSURANCE

- 20.01 Article 6 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 Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 – SIGNING OF AGREEMENT

- 21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 22 – NOT USED

ARTICLE 23 – NOT USED

ARTICLE 24 – POWER OF ATTORNEY

- 24.01 Attorneys-in-fact who sign Bid Bonds or Contract Bonds must file with each bond a certified and effective dated copy of their power of attorney.

ARTICLE 25 – LAWS AND REGULATIONS

- 25.01 The Bidder's attention is directed to the fact that all applicable State Laws, municipal ordinance, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

ARTICLE 26 – SAFETY STANDARDS AND ACCIDENT PREVENTION

26.01 With respect to all Work performed under this contract, the Contractor shall:

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

ARTICLE 27 – WAGE RATE REQUIREMENTS

27.01 If the contract price is in excess of \$100,000, provisions of the Contract Work Hours and Safety Standards Act at 29 CFD 5.5(b) apply.

ARTICLE 28 – NOT USED

PROCUREMENT FORMS & SUPPLEMENTS

**BID FORM
21015
WESTERN MASON WATER DISTRICT
SYSTEM IMPROVEMENTS PROJECT – CONTRACT NO.1 WATER MAIN REPLACEMENT
AND BOOSTER PUMP STATION
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ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

**PHYSICAL ADDRESS: WESTERN MASON WATER DISTRICT
2573 MARY INGLES HIGHWAY
DOVER, KENTUCKY 41034**

**MAILING ADDRESS: WESTERN MASON WATER DISTRICT
P.O. BOX 49
DOVER, KENTUCKY 41034**

1.02 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.

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

<u>Addendum No.</u>	<u>Addendum, Date</u>

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance

- of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.
- E. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
 - F. 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.
 - G. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
 - H. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
 - I. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. 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 collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

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

BID SCHEDULE

Item No.	Description	Estimated Quantity	Unit	Bid Unit Price	Bid Price
1	6" PVC Water Main, Class 250	17,500	LF		
2	3" PVC Water Main, Class 250	5,000	LF		
3	2" PE Water Main, HDPE DR-9	3,500	LF		
4	Directional Drill, 8" HDPE DR-9	75	LF		
5	Directional Drill, 4" HDPE DR-9	50	LF		
6	10" PVC Casing, Open Cut	225	LF		
7	Tapping Sleeve & Valve	4	EA		
8	6" Gate Valve & Box	15	EA		
9	4" Gate Valve & Box	1	EA		
10	3" Gate Valve & Box	5	EA		
11	Cut & Plug Existing W.M.	9	EA		
12	12" Steel Casing, Bore & Jack	325	LF		
13	Connection to Existing W.M.	5	EA		
14	Flushing Hydrant Assembly	4	EA		
15	Underground Blow Off Assembly	2	EA		
16	New Customer Service	75	EA		
17	Air Release Valve	1	EA		
18	Additional Service Tubing	600	LF		
19	New Minerva BPS and Appurtenances	1	LS		
20	Furnishing, setting in place, and installation of a permanently mounted backup generator with associated concrete pad at the District's new Minerva BPS. Generator shall be propane fueled, 3 Phase, minimum 60 kW, 277/480 volts, weather enclosed. Additionally a 500 gallon propane tank to be installed near the generator. Installation of concrete pads for both generator and propane tank.	1	LS	\$100,000	\$100,000.00
21	Clean up and restoration of disturbed areas	26,000	LF	\$1.50	\$39,000.00
Total of All Unit Price Bid Items					\$

TOTAL BASE BID: _____ DOLLARS
& _____ CENTS

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete within 75 calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 90 calendar days after the date when the Contract Times commence to run.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. List of Project References;
 - E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
 - F. Contractor's License No.: _____ [or] Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - G. Required Bidder Qualification Statement with supporting data; and

ARTICLE 8 – DEFINED TERMS

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

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

By:

[Signature] _____

[Printed name] _____

(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

Bidder's License No.: _____
(where applicable)

NOTE TO USER: Use in those states or other jurisdictions where applicable or required.

BID BOND

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

BIDDER (*Name and Address*):

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

OWNER (*Name and Address*):

Western Mason Water District
2573 Mary Ingles Highway
Dover, KY 41034

BID

Bid Due Date:

Description: Installation of approximately 26,000 LF of 6" and 3" water main and appurtenances and replacement of one booster pump station.

BOND

Bond Number:

Date:

Penal sum _____ \$ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER

SURETY

Bidder's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By:

Signature

By:

Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest:

Signature

Attest:

Signature

Title

Title

Note: Addresses are to be used for giving any required notice.

Provide execution by any additional parties, such as joint venturers, if necessary.

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. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
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 of 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 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 the 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 the 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 of 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.

QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm: _____

Address: _____

2. SUBMITTED TO: _____

3. SUBMITTED FOR: _____

Owner: Western Mason Water District

Project Name: System Improvements Project – Contract No. 1 Water Main Replacement and Replacement of Booster Pump Station

TYPE OF WORK: Water Main Replacement, Booster Pump Station

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person: _____

Title: _____

Phone: _____

Email: _____

5. AFFILIATED COMPANIES:

Name: _____
Address: _____

6. TYPE OF ORGANIZATION:

SOLE PROPRIETORSHIP

Name of Owner: _____
Doing Business As: _____
Date of Organization: _____

PARTNERSHIP

Date of Organization: _____
Type of Partnership: _____
Name of General Partner(s): _____

CORPORATION

State of Organization: _____
Date of Organization: _____
Executive Officers:
- President: _____
- Vice President(s): _____

- Treasurer: _____
- Secretary: _____

LIMITED LIABILITY COMPANY

State of Organization: _____

Date of Organization: _____

Members: _____

JOINT VENTURE

Sate of Organization: _____

Date of Organization: _____

Form of Organization: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

7. LICENSING

Jurisdiction: _____

Type of License: _____

License Number: _____

Jurisdiction: _____

Type of License: _____

License Number: _____

8. CERTIFICATIONS

CERTIFIED BY:

Disadvantage Business Enterprise: _____

Minority Business Enterprise: _____

Woman Owned Enterprise: _____

Small Business Enterprise: _____

Other (_____): _____

9. BONDING INFORMATION

Bonding Company: _____

Address: _____

Bonding Agent: _____

Address: _____

Contact Name: _____

Phone: _____

Aggregate Bonding Capacity: _____

Available Bonding Capacity as of date of this submittal: _____

10. FINANCIAL INFORMATION

Financial Institution: _____

Address: _____

Account Manager: _____

Phone: _____

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE LAST 3 YEARS

11. CONSTRUCTION EXPERIENCE:

Current Experience:

List on **Schedule A** all uncompleted projects currently under contract (If Joint Venture list each participant's projects separately).

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (If Joint Venture list each participant's projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

YES NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

YES NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

EJCDC® C-451, Qualifications Statement.

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BIDDER'S QUALIFICATION STATEMENT

YES NO

If YES, attach as an Attachment details including Project Owner's contact information.

12. SAFETY PROGRAM:

Name of Contractor's Safety Officer: _____

Include the following as attachments:

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA No. 500- Log & Summary of Occupational Injuries & Illnesses for the past 5 years.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

Workers' compensation Experience Modification Rate (EMR) for the last 5 years:

YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____

Total Recordable Frequency Rate (TRFR) for the last 5 years:

YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____

Total number of man-hours worked for the last 5 Years:

YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____

13. EQUIPMENT:

MAJOR EQUIPMENT:

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HERewith, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS _____ DAY OF _____, 20____

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES: _____

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.
5. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
7. Required safety program submittals listed in Section 13.
8. Additional items as pertinent.

SCHEDULE A

CURRENT EXPERIENCE

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

CONTRACTING FORMS

NOTICE OF AWARD

Date of Issuance:

Owner: Western
Mason Water District

Owner's Contract No.:

Engineer: Bluegrass
Engineering, PLLC

Engineer's Project No.:
21015

Project: Contract 1 –
System Improvements
Project

Contract Name:

Bidder:

Bidder's Address:

TO BIDDER:

You are notified that Owner has accepted your Bid dated _____ for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

Contract 1 – System Improvements Project

The Contract Price of the awarded Contract is: \$_____

[] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically. *[revise if multiple copies accompany the Notice of Award]*

a set of the Drawings will be delivered separately from the other Contract Documents.

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

1. Deliver to Owner [5] counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and 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 Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: Western Mason Water District

Authorized Signature

By:

Title: Chairman

**AGREEMENT
BETWEEN OWNER AND CONTRACTOR FOR
CONSTRUCTION CONTRACT (STIPULATED PRICE)**

Prepared by



Issued and Published Jointly by



Endorsed by



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www.nspe.org

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(202) 347-7474
www.acec.org

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AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between Western Mason Water District (“Owner”) and _____ (“Contractor”).

Owner and Contractor hereby 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:

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

Contract 1 – Water Main Replacement and Booster Pump Station Replacement

ARTICLE 3 – ENGINEER

3.01 The part of the Project that pertains to the Work has been designed by **BLUEGRASS ENGINEERING, PLLC, GEORGETOWN, KENTUCKY**.

3.02 The Owner has retained **BLUEGRASS ENGINEERING, PLLC, GEORGETOWN, KENTUCKY** (“Engineer”) 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 *Contract Times: Days*

A. The Work will be substantially completed within **75** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **90** 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 as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of

requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner **\$750.00** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.
2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$750.00** for each day that expires after such time until the Work is completed and ready for final payment.
3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

4.04 *Special Damages*

- A. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), 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 the amounts that follow, subject to adjustment under the Contract:

- A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 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 on or about the 3rd Monday of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based

on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

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 Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract
 - a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and
 - b. 100 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 5 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the rate of 0 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
 - B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

- E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no 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.
- 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 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.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 Contents

- A. The Contract Documents consist of the following:
 - 1. This Agreement (pages 1 to 8, inclusive).
 - 2. Performance bond (pages 1 to 4, inclusive).
 - 3. Payment bond (pages 1 to 4, inclusive).
 - 4. Other bonds.
 - a. (pages to , inclusive).
 - 5. General Conditions (pages 1 to 64, inclusive).
 - 6. Supplementary Conditions (pages 1 to 9, inclusive).
 - 7. Specifications as listed in the table of contents of the Project Manual.
 - 8. Drawings (not attached but incorporated by reference) consisting of 29 sheets with each sheet bearing the following general title: Water System Improvements Project [or] the Drawings listed on the attached sheet index.
 - 9. Addenda (numbers N/A to , inclusive).
 - 10. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages 1 to 5, inclusive).
 - 11. ~~USDA Rural Utilities Service Kentucky Bulletin 1780-2, Guidance for Implementation of American Iron and Steel (AIS), (pages 1 to 31, inclusive). NA~~

12. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
- 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 the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, 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, money that may become due and money that is 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 successors, assigns, and legal representatives to the other party hereto, its 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.

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

10.06 *Other Provisions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

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

OWNER:

CONTRACTOR:

Western Mason Water District

By: _____

By: _____

Title: Chairman

Title: Member

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for giving notices:

Address for giving notices:

2573 Mary Ingles Highway

Dover, Kentucky 41034

License No.: _____

(where applicable)

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

NOTE TO USER: Use in those states or other jurisdictions where applicable or required.

NOTICE TO PROCEED

Owner:	Western Mason Water District	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Bluegrass Engineering, PLLC	Engineer's Project No.:	21015
Project:	System Improvements Project – Contract No. 1	Contract Name:	
		Effective Date of Contract:	

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on _____ . *[see Paragraph 4.01 of the General Conditions]*

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, the date of Substantial Completion is _____ , and the date of readiness for final payment is _____ .

Before starting any Work at the Site, Contractor must comply with the following:
See Specifications

Owner: Western Mason Water District

By: Authorized Signature

Title: Chairman

Date Issued:

Copy: Engineer

PROJECT FORMS



PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

Western Mason Water District
2573 Mary Ingles Highway
Dover, Kentucky 41034

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description *(name and location):*

BOND

Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*
Amount:
Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal *(seal)*

Surety's Name and Corporate Seal *(seal)*

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:
 - 3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 - 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 7.2 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 5; and

- 7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
14. Definitions
- 14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
- 14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
- 14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
- 14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
16. Modifications to this Bond are as follows:

PAYMENT BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

Western Mason Water District

2573 Mary Ingles Highway

Dover, Kentucky 41034

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form: None See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

(seal)

Contractor's Name and Corporate Seal

(seal)

Surety's Name and Corporate Seal

By: _____
 Signature

By: _____
 Signature *(attach power of attorney)*

 Print Name

 Print Name

 Title

 Title

Attest: _____

Attest: _____

EJCDC® C-615, Payment Bond

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 and American Society of Civil Engineers. All rights reserved. 1 of 3

PAYMENT BOND

Signature

Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
 - 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2 Pay or arrange for payment of any undisputed amounts.
 - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

EJCDC® C-615, Payment Bond

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PAYMENT BOND

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. **Definitions**
- 16.1 **Claim:** A written statement by the Claimant including at a minimum:
1. The name of the Claimant;
 2. The name of the person for whom the labor was done, or materials or equipment furnished;
 3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
18. Modifications to this Bond are as follows:

SECTION 006216

INSURANCE CERTIFICATE

Certificate of Insurance shall be provided in accordance with the General Conditions, this Division, Section 007243.

OWNER'S MINIMUM INSURANCE REQUIREMENTS

The Contractor at its expense shall procure and shall maintain the insurance required in this Contract and to be provided by the Contractor. The Contractor shall require each subcontractor to procure and maintain the insurance required by this Contract and to be provided by subcontractors. At a minimum, the following insurance Limits shall be procured:

General Liability – Commercial General Liability

Limits of Insurance - \$2,000,000 general aggregate
 \$2,000,000 products & completed operations aggregate
 \$1,000,000 personal & advertising
 \$1,000,000 each occurrence

Automobile Liability – All Owned, Non-owned & Hired vehicles

Limits of Liability - \$1,000,000 per accident

Excess or Umbrella Liability

Limits of Liability - \$2,000,000

Workmen's Compensation – Statutory Coverage in each state of operations or “all states” coverage

Limits of Liability - \$100,000 each accident bodily injury
 \$500,000 policy limit bodily injury by disease
 \$100,000 each employee bodily injury by disease

Description of Operations

Western Mason Water District and Bluegrass Engineering, PLLC must be added to the Commercial General Liability policy as an additional insured by Standard Endorsements CG 2010(11-85) and CG 2037 or their equivalents.

All policies, except workers compensation, shall include a waiver of subrogation.

Certificate Holder

Must list: Western Mason Water District
 2573 Mary Ingles Highway
 Dover, Kentucky 41034

Cancellation

Thirty (30) days prior written notice is required.

Builders Risk/Installation Floater

May be required in an amount equal to the contract if above ground structures are involved in the Contract.

END OF SECTION

INSURANCE CERTIFICATE
 (UNIT PRICE)



Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): Western Mason Water District	From (Contractor):	Via (Engineer):
Project: System Improvements Project - Contract No. 1	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 21015

**Application For Payment
Change Order Summary**

Approved Change Orders	Number	Additions	Deductions			
				1. ORIGINAL CONTRACT PRICE.....	\$	_____
				2. Net change by Change Orders.....	\$	_____
				3. Current Contract Price (Line 1 ± 2).....	\$	_____
				4. TOTAL COMPLETED AND STORED TO DATE		
				(Column F total on Progress Estimates).....	\$	_____
				5. RETAINAGE:		
				a. X _____ Work Completed.....	\$	_____
				b. X _____ Stored Material.....	\$	_____
				c. Total Retainage (Line 5.a + Line 5.b).....	\$	_____
				6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c).....	\$	_____
				7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application).....	\$	_____
				8. AMOUNT DUE THIS APPLICATION.....	\$	_____
				9. BALANCE TO FINISH, PLUS RETAINAGE		
				(Column G total on Progress Estimates + Line 5.c above).....	\$	_____
TOTALS						
				NET CHANGE BY		
				CHANGE ORDERS		

Contractor's Certification	
The undersigned Contractor certifies, to the best of its knowledge, the following: (1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment; (2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and (3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.	
Contractor Signature	
By: _____	Date: _____

Payment of:	\$ _____	(Line 8 or other - attach explanation of the other amount)
is recommended by:	_____	(Engineer) (Date)
Payment of:	\$ _____	(Line 8 or other - attach explanation of the other amount)
is approved by:	_____	(Owner) (Date)
Approved by:	_____	Funding or Financing Entity (if applicable) (Date)

Change Order No. _____

Date of Issuance:		Effective Date:	
Owner:	Western Mason Water District	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Bluegrass Engineering, PLLC	Engineer's Project No.:	21015
Project: System		Contract Name:	
Improvements Project			

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES <i>[note changes in Milestones if applicable]</i>
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: \$ _____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: \$ _____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____ Engineer (if required)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title _____	Title _____
Date: _____	Date _____	Date _____

Approved by Funding Agency (if applicable)

By: _____ Date: _____
Title: _____

CERTIFICATE OF OWNER'S ATTORNEY AND AGENCY CONCURRENCE

CERTIFICATE OF OWNER'S ATTORNEY

PROJECT NAME: Contract No. 1 - System Improvements Project

CONTRACTOR NAME:

I, the undersigned, _____, the duly authorized and acting legal representative of Western Mason Water District do hereby certify as follows: I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and 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 the terms, conditions, and provisions thereof.

Name

Date

AGENCY CONCURRENCE

As lender or insurer of funds to defray the costs of this Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

Agency Representative

Date

Name

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: Western Mason Water District
 Contractor:
 Engineer: Bluegrass Engineering, PLLC
 Project: System Improvements Projects

Owner's Contract No.:
 Contractor's Project No.:
 Engineer's Project No.:21015
 Contract Name:

This [preliminary] [final] Certificate of Substantial Completion applies to:

- All Work The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: None
 As follows

Amendments to Contractor's responsibilities: None
 As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

<p>EXECUTED BY ENGINEER:</p> <p>By: _____ (Authorized signature)</p> <p>Title: _____</p> <p>Date: _____</p>	<p>RECEIVED:</p> <p>By: _____ Owner (Authorized Signature)</p> <p>Title: _____</p> <p>Date: _____</p>	<p>RECEIVED:</p> <p>By: _____ Contractor (Authorized Signature)</p> <p>Title: _____</p> <p>Date: _____</p>
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CONDITIONS OF THE CONTRACT

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



Endorsed by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 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. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document 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, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision

regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice 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.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *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, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *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.
40. *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.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *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 a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments

during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

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

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE**3.01 Intent**

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

3.02 Reference Standards

- A. Standards Specifications, Codes, Laws and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract 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, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 Reporting and Resolving Discrepancies

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.
- B. *Resolving Discrepancies:*
1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - 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 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *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 Contract 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 Contract. 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 Contract, whichever date is earlier.

4.02 *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 such date.

4.03 *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.

4.04 *Progress Schedule*

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

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
2. abnormal weather conditions;
3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS5.01 *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.
- 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 permanent improvements are to be made 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.

5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste

materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
 1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or

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

then Contractor 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 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. 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 Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site

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

- c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
- 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor 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 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.
- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and

recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. 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 Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer,

or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. 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, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond

signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, 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.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 Contractor's Insurance

- A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
 4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. 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.
- C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against 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. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- G. *Additional insureds:* The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance:* If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising

out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

- I. *General provisions:* The policies of insurance required by this Paragraph 6.03 shall:
1. include at least the specific coverages provided in this Article.
 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 5. be appropriate for the Work being performed and provide protection from claims that 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.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, 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.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable 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 Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder

of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as “insureds.”

2. be written on a builder’s risk “all risk” policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder’s risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
6. extend to cover damage or loss to insured property while in transit.
7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.
8. allow for the waiver of the insurer’s subrogation rights, as set forth below.
9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
10. not include a co-insurance clause.
11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, 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 insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 Receipt and Application of Property Insurance Proceeds

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES**7.01** *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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner’s written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *“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 Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item 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 is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an “or equal” item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.
- C. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete and Engineer determines that the proposed item is an “or-equal”, which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request shall result in any change in Contract Price. The Engineer’s denial of an “or-equal” request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

- G. 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 the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. 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.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. 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.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents,

consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, 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 the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *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.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of 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 or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated

contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

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

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, 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 Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform

any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *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.

7.14 *Hazard Communication Programs*

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

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or 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.

7.16 *Shop Drawings, Samples, and Other Submittals*

- A. *Shop Drawing and Sample Submittal Requirements:*
 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
1. *Shop Drawings:*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on 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 7.16.D.
 2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.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 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was

provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

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

- 9.04 *Pay When Due*
- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.
- 9.05 *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 *Insurance*
- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 *Change Orders*
- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 *Inspections, Tests, and Approvals*
- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 *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.
- 9.10 *Undisclosed Hazardous Environmental Condition*
- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 *Evidence of Financial Arrangements*
- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).
- 9.12 *Safety Programs*
- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION**10.01 *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.

10.02 *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 10.08. Particularly, but without limitation, during or as a result of Engineer’s visits or observations of Contractor’s Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. 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.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer’s authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer’s authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer’s authority as to Change Orders is set forth in Article 11.
- D. Engineer’s authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, 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 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.
3. *Field Orders:* Engineer may authorize minor changes in the Work if the changes 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. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *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, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee*: When applicable, the Contractor's fee 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 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.
 1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer

is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. 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;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

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

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making

the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval:* If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work:* The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and 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 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
 5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), 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 communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here 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 Paragraph 13.01.B.
- D. *Contractor's Fee*: When the Work as a whole 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, Change Proposal, Claim, set-off, or other 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 11.04.C.
- E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

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

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual

conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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

14.01 Access to Work

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

14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- 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, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer

as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, 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, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; 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.

14.07 *Owner May Correct Defective Work*

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

- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

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

E. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

- j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. 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;
 - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *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 and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially

complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

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

15.06 *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, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in

Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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 15.07. 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. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 1. correct the defective repairs to the Site or such other adjacent areas;
 2. correct such defective Work;
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or

arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *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 written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination 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);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the

Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds 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.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner

or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal 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 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 2. agree with the other party to submit the dispute to another dispute resolution process; or
 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract 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.

18.03 *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. 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.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Headings*

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

SECTION 007305

SUPPLEMENTARY GENERAL CONDITIONS

TO EJCDC GENERAL CONDITIONS

SUPPLEMENTAL GENERAL CONDITIONS TO EJCDC GENERAL CONDITIONS

These Supplementary General Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

These revisions to the General Conditions are requirements of the funding agency and are applied in conjunction with the Supplemental General Conditions.

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

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

SGC-1.01.A.8.

Add the following language to the end of Paragraph 1.01.A.8:

The Change Order form to be used on this Project is EJCDC No. C-941. Agency approval is required before Change Orders are effective.

SGC-1.01.A.48.

Add the following language at the end of the last sentence of Paragraph 1.01.A.48:

A Work Change Directive cannot change Contract Price or Contract Times without a subsequent Change Order.

SGC-1.01.A.49.

Add the following new Paragraph after Paragraph 1.01.A.48:

49. *Abnormal Weather Conditions* – Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.

The Contract completion time includes an allowance for an average number of inclement weather days as follows:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOT
Precipitation	7	7	9	8	8	8	8	7	6	5	5	7	87
Freezing Temperature	10	6	1	0	-	-	-	-	-	-	1	5	22
TOTAL	17	13	10	8	8	8	8	7	6	5	6	12	109

When number of days (including Saturdays, Sundays and Holidays) of Precipitation in excess of 0.1" per day or maximum daily temperature of 32 degrees F. exceed those shown above in any month, the CONTRACTOR shall be entitled to that number of additional days for contract completion.

- If, in the ENGINEER'S opinion, sustained bad weather conditions prevent satisfactory performance of the work, he may suspend operations for an executed period until weather conditions are favorable. In this event, contract completion time shall be extended an equal number of days. Upon suspension of the work by the ENGINEER, the CONTRACTOR shall properly protect his work during the suspension period.
- If the project is not completed within the specified time, the CONTRACTOR'S retainage may be used by the OWNER as one source of funds to compensate the ENGINEER for additional engineering services required because of time delays.

SGC-2.02.A

Amend the first sentence of Paragraph 2.02.A to read as follows:

Owner shall furnish to Contractor three copies of the Contract Documents (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF).

SGC-4.01

Delete the following sentence from Paragraph 4.01A:

In no event will the Contract Times commence to run later than the ninetieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

SGC-4.05

Replace the phrase "abnormal weather conditions" from Paragraph 4.05.C.2 and replace with "Abnormal Weather Conditions"

SGC-5.03

Add the following new paragraph after Paragraph 5.03B:

If any geotechnical exploration for the project was performed and reported, said report will be included as an Appendix. The geotechnical report shall be used as a reference.

SGC-5.06

Add the following new paragraph immediately after Paragraph 5.06.A.2:

3. If any Hazardous Environmental Conditions are found, reported, or know by the Owner for the project, said report will be included as an Appendix.

SGC-6.03

Add the following paragraphs after Paragraph 6.03.J:

K. The insurance required by this Paragraph shall include specific coverage and be written for not less than the limits of liability and coverages tabulated in Section 00901 – Special Conditions, or as required by law, whichever is greater.

SGC-7.04

Amend the third sentence of Paragraph 7.04.A by deleting the following words:

Unless the specification or description contains or is followed by words reading that no like, equivalent or “or-equal” item is permitted

SGC-7.04

Amend the last sentence of Paragraph 7.04.A.1.a.3 by striking out “and”, and adding a period at the end of said paragraph.

SGC-7.04

Delete Paragraph 7.04.A.1.a.4 in its entirety and insert the following in its place:

(Deleted)

SGC-7.06

Amend Paragraph 7.06.A by adding the following text to the end of the Paragraph:

The contractor shall not award work valued at more than fifty percent of the Contract Price to Subcontractor(s), without prior written approval of the Owner.

SGC-7.06

Delete Paragraph 7.06.B in its entirety and insert the following in its place.

(Deleted)

SGC-7.06

Amend the second sentence of Paragraph 7.06.E by striking out “Owner may also require Contractor to retain specific replacements; provided, however, that”.

SGC-10.03.A.

The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be as stated in the document attached to these Supplementary General Conditions.

SGC-13.02

Delete Paragraph 13.02.C in its entirety and insert the following in its place:

(Deleted)

SGC-15.01

Amend the second sentence of Paragraph 15.01B.1 by striking out the following text: “a bill of sale, invoice or other”.

SGC-15.01

Add the following new paragraph after Paragraph 15.01.B.3:

4. The Application for Payment form to be used on this Project is EJCDC No. C-620.

SGC-15.01

Add the following language at the end of Paragraph 15.01.B.3:

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.

SGC-15.01

Delete Paragraph 15.01.D.1 in its entirety and insert the following in its place:

The Application for Payment with Engineer’s recommendations will be presented to the Owner for consideration. If both Owner find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SGC-15.02

Amend Paragraph 15.02.A by striking out the following text: “no later than seven days after the time of payment by Owner” and inserting “no later than the time of payment by the Owner.”:

SGC-18.11

Add the following new paragraph after Paragraph 18.10:

18.11 Tribal Sovereignty.

- A. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the named Tribe; affecting the trust-beneficiary relationship between the Secretary of the Interior, Tribe and Indian landowner(s); or interfering with the government-to government relationship between the United States and the Tribe.

SGC-19 Add a new Article 19, “Federal Requirements,” after Article 18.

SGC-19.01

Add the following language at the beginning of Article 18 with the title “Agency Not a Party.”

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

SGC-19.02

Add the following language after Article 19.01.A with the title “Contract Approval.”

- A. Owner and Contractor will furnish Owner’s attorney such evidence as required so that Owner’s attorney can complete and execute the following “Certificate of Owner’s Attorney” (Exhibit GC-A) before Owner submits the executed Contract Documents to Agency for approval.
- B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

SC 19.03

Add the following language after Article 19.02.B with the title “Conflict of Interest.”

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer. Owner’s officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner’s officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

SC-19.04

Add the following language after Article 19.03.A with the title “Gratuities.”

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor’s agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 19.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other

damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

SC-19.05

Add the following language after Article 19.04.B with the title “Audit and Access to Records.”

- A. Owner, Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Engineer which are pertinent to the Agreement, for the purpose of making audits, examinations, excerpts, and transcriptions. Engineer shall maintain all required records for three years after final payment is made and all other pending matters are closed.

SC-19.06

Add the following language after Article 18.05.A with the title “Small, Minority and Women’s Businesses.”

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women’s businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women’s businesses on solicitation lists; (2) assuring that small, minority and women’s businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women’s businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women’s businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

SGC-19.07 Add the following after Article 19.06.A with the title “Anti-Kickback.”

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States”). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

SGC-19.08

Add the following after Article 19.07.A with the title “Clean Air and Pollution Control Acts.”

- A. If this Contract exceeds \$100,000, Compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h) and 42 USC 7401et. seq.), section 508 of the Clean Water Act (33 U.S.C. 1368) and Federal Water Pollution Control Act (33 USC 1251 et seq.), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15) is required. Contractor will report violations to the Agency and the Regional Office of the EPA.

SGC-19.09

Add the following after Article 19.08 with the title “State Energy Policy.”

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

SGC-19.10 Add the following after Article 19.09 with the title “Equal Opportunity Requirements.”

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, “Equal Employment Opportunity,” as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and as supplemented by regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”
- B. Contractor’s compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor’s goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.
- C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

SGC-19.11**Add the following after Article 19.10.C:**

19.11 Restrictions on Lobbying.

- A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. 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, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

SGC-19.12**Add the following after Article 19.11.A :**

19.12 Environmental Requirements.

When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:

- A. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
- B. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.
- C. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
- D. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process

and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

- E. Mitigation Measures – If the project had an Environmental Report, Environmental Assessment, or Environmental Impact Statement to meet the requirements of the National Environmental Policy Act, compliance with the mitigation measures, if any, in that document are hereby included as a condition of this contract.

SPECIAL CONDITIONS

SC-1 LINES, GRADES AND ELEVATIONS

From the information provided by the Engineer, the Contractor shall verify bench marks and develop and make all detail surveys needed for construction.

The Contractor shall set and maintain all necessary intermediate points, lines, grades and elevations, and provide slope stakes, offset stakes, batter boards, stakes for pipe locations, and other such items at his own expense. Where the Contractor uses the laser for control, the Contractor shall periodically check the grade and alignment during each day's operation.

The accuracy of the Contractor's survey and other required data is the sole responsibility of the Contractor, and the furnishing of data to the Engineer does not constitute a transferal of responsibility for checking.

SC-2 MOBILIZATION AND DEMOBILIZATION

Mobilization shall include the purchase of Contract bonds and all necessary permits; transportation of all personnel, equipment and operating supplies to the site; establishment of offices, buildings, sanitary facilities, telephone service, construction identification signs and other necessary facilities at the site; construction and maintenance of temporary access roads, bridges, and maintenance and protection of traffic during construction, and other preparatory work at the site. Mobilization shall also include the installation of barriers or fencing to limit public access to the site.

Demobilization shall include removal of all unused material and equipment including field offices, construction barriers, and soil and erosion control materials. All work and work areas shall be neatly cleaned upon completion according to the Engineer's direction and shall be left in a neat and orderly condition. Access roads constructed solely for the Contractor's use shall be graded to conform with adjacent ground. Any salvaged material not specified to be disposed of otherwise shall become the property of the Contractor and removed from the site. All trash shall be removed as directed by the Engineer and disposed of according to local regulations.

SC-3 WORKING HOURS AND HOLIDAYS

The Contractor shall perform all work Monday through Friday during which period the Owner's or Engineer's representative will be on-site to inspect the work. The Contractor may seek permission to perform work outside this period that will require inspection by the Owner's or Engineer's representative. Overtime work performed by the Contractor shall be at no additional cost to the contract.

The Contractor shall recognize in the work schedule that normal holidays are observed each calendar year. Work may be allowed during holidays, whenever holiday work is scheduled, the Contractor shall give prior notice to the Owner.

SC-4 PRE-WORK CONFERENCE

Prior to the start of construction by the successful bidder, a general information meeting shall be held with the Owner, Engineer, Contractor and other interested parties in attendance. The meeting shall cover the general features of the project and the various requirements in the Contract. The Contractor shall submit a draft work schedule prior to the meeting in accordance with the Work Schedule and Construction Activity requirements in the Special Provisions.

SC-5 PROGRESS AND COORDINATION MEETINGS

Progress and coordination meetings will be held biweekly or as directed by the Engineer, with the Contractor's supervisory representatives, having decision-making authority, in attendance.

The Contractor shall conduct the following meetings between:

- Contractor's project manager
- Contractor's project superintendent
- Engineer's designated Representative
- Owner's designated Representative
- Subcontractors

Meetings shall be held at approximately biweekly intervals or more frequently as called by the Engineer. The Engineer shall schedule the meetings. The Engineer shall take minutes at the meeting, review minutes with participants at the meeting and forward copies of the meeting minutes to the participants within fourteen days after the meeting date.

Agenda for the meeting shall consist of, but not be limited to, the following:

- Construction progress for the past month
- Construction schedule for upcoming month
- Pay request and materials stored lists
- Test results for tests performed during the month
- Problems with construction
- Pending or upcoming change orders
- Other items as deemed necessary by attendees

Contractor shall submit a work schedule update and submittal schedule update at each meeting if either is behind schedule.

SC-6 PRE-WORK ON-SITE VIDEO RECORDING

For video and photography requirements see SECTION 013800 CONSTRUCTION PHOTOGRAPHY AND VIDEO.

SC-7 PHOTOGRAPHY DURING CONSTRUCTION

The Contractor shall snap color photos on a periodic basis as specified in the Contract Documents.

SC-8 PROGRESS PAYMENTS AND RETAINAGE

All progress payments will be on the basis of progress of the Work. Owner will retain a portion of each Progress Payment otherwise due the Contractor. The following retention policy shall apply:

- Retainage of five (5) percent of the payment claimed until the work is complete.
- When the work is substantially complete, the retainage shall be two hundred (200) percent of the amount necessary as determined by the Owner to assure completion of the remaining work.
- The Owner may increase the retainage up to ten (10) percent, if the Owner determines, at its discretion, that the Contractor is not making satisfactory progress or there is other specific cause for such withholding.

Final payment shall include the interest earned on the withholding provided the work was completed within the time limits specified for the prices specified in the Contract or approved Change Orders.

SC-9 PERMITS

With reference to the General Conditions, Section 2, the following permits and associated fees are being obtained and paid by the Owner:

Kentucky Division of Water

The Contractor shall be responsible for obtaining any additional Local, County, State or Federal issued permits necessary for the Work. This includes all Building Permits and local inspection permits. Contractor shall pay all fees associated with obtaining such permits.

SC-10 WORK SCHEDULE AND CONSTRUCTION ACTIVITIES

The work schedule prepared by the Contractor (reference Section GC-3.02) shall be prepared in such detail as to enable regular monitoring and updating throughout construction. The work schedule shall demonstrate compliance with all milestones, durations and constraints stipulated in the Contract Documents. The work schedule shall include tasks for shop drawing submittal, shop drawing review, manufacture and delivery, start-up and testing. No separate payment will be made for developing or updating the work schedule.

The work schedule shall be developed utilizing computerized integrated Critical Path Method (CPM) planning software such as Primavera, Microsoft Project, or Suretrak and shall be resource-loaded. Tasks shall be indicated in the form of a legible bar and shall show proposed start and end dates and duration of all major components and activities included in the Contract. The schedule shall include tasks for shop drawing submittal, shop drawing review, manufacture and delivery, start-up and testing. The schedule shall indicate a baseline bar for each task and a bar indicating the actual progress of the task. The General Contractor shall integrate and take into account the work of the other Contractors, and the other Contractors shall provide input to the General Contractor's schedule and shall review the compiled work schedule for acceptance.

The General Contractor shall update the work schedule on a monthly basis throughout construction. A copy of the updated work schedule shall be submitted to the Engineer along with each payment application, along with copies of certified payrolls and required MBE/WBE documentation. Payment applications will not be reviewed by the Engineer until an acceptable updated work schedule has been received.

SC-11 CONSTRUCTION ACCESS

The Contractor shall also recognize that a portion of the access roadways to the work site are public roadways that will carry local, public traffic. Public traffic to and from this area may occur at all hours. The Contractor shall provide and install all necessary construction traffic signage, including, but not limited to signs for speed limit; temporary construction indication; stop signs. Temporary signs shall be in accordance with KY DOT.

The Contractor shall make no claim against the Owner due to redirection of construction access location.

SC-12 MAINTENANCE OF EXISTING ACCESS ROAD

The Contractor shall include in the lump sum Bid costs to maintain the existing access road for construction traffic in acceptable condition during the construction period. Acceptable conditions shall mean that potholes and excessive deterioration of the existing road due to heavy construction traffic shall be repaired promptly by the Contractor. Potholes deeper than 6-inches and/or greater than 12-inches in any plan direction shall be filled and compacted with subbase aggregate. Where deterioration in a specific area is greater than 10 square feet, the area shall be paved in accordance with the Section, entitled "Restoration of Surfaces".

Regardless of the above criteria, if, in the sole opinion of the Owner or Engineer, it is deemed that the safety of public traffic is compromised due to road deterioration from the Contractor's construction traffic, the Engineer may direct the Contractor to repair the deteriorated portions in accordance with the Section, entitled "Restoration of Surfaces" at no additional costs to the Contract.

The Contractor shall apply water sprinkling, or other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

SC-13 DUST AND DEBRIS CONTROL

The Contractor shall provide means for controlling dust at the site throughout the duration of the project. The Contractor shall promptly remove any mud tracked onto adjacent roadways from vehicles leaving or entering the project site. The Contractor shall also provide necessary measures to prevent dust and debris from construction activities from entering or falling into the water being processed in the existing treatment plant.

SC-14 MATERIAL STORAGE

The Contractor shall be responsible to provide material storage (either on- or off-site) as required to complete construction. The Contractor shall not cut or remove any trees on the site for purposes of material storage. The Contractor shall identify the proposed storage location for approval by the Engineer. Any relocation of the storage area during the project shall require approval of the Engineer.

SC-15 ON-SITE AND/OR OFF-SITE SOIL BORROW MATERIAL

- A. The Contractor is permitted to use on-site soil borrow material as embankment material, as accepted by the Engineer, provided it meets all the requirements as specified for the type of earthwork being performed. If the Contractor elects to use this material, the Contractor is solely responsible for assessing and insuring that the material meets the requirements of the Contract Documents. The Contractor is solely responsible for costs associated with using on-site borrow material including but not limited to, permitting costs, borrow source development, excavation, transportation, laboratory testing, placement, and restoration of the borrow source.
- B. On-site and/or off-site soil borrow material to be used as fill to meet subgrades beneath structures shall meet the requirements of the Section, entitled "Embankment", with the following exceptions:

Particle-Size Distribution

1. Soil material shall be run-of-bank gravel with the following gradation by weight, in accordance with ASTM D422:

<u>% Passing</u>	<u>Sieve</u>
100%	1-1/2 inch
30% to 65%	1/4 inch
0% to 10%	No. 200

2. Soil material shall be tested for grain size at a frequency of one (1) test per 500 cubic yards of material, or as otherwise requested by the Engineer. A minimum of one (1) grain size test shall be performed for the soil material used beneath each structure, or as otherwise requested by the Engineer.
3. The results of all testing specified herein shall be submitted to the Engineer for review.

Density Control

1. Soil material shall be compacted to 95% of maximum dry density as determined by the density tests designated in ASTM D1557.
 - a. Compaction curves for the full range of soil materials to be used shall be developed by an approved independent testing laboratory.
 2. Field control samples shall be taken and tested by an independent testing laboratory as required to assure that adequate compaction of the soil material is being achieved.
 3. A minimum of one (1) in-place density test shall be made for every 1,000 square feet of compacted area per lift, or as otherwise requested by the Engineer. A minimum of two (2) in-place density tests per lift shall be performed for the compacted area beneath each structure, or as otherwise requested by the Engineer.
 - a. In-place density of soil material shall be determined by the methods described in ASTM D1556 or ASTM D2922 and expressed as a percentage of the maximum dry density.
 4. The results of all testing specified herein shall be submitted to the Engineer for review.
- C. On-site and/or off-site soil borrow material to be used as elsewhere shall meet the requirements of the Section titled "Embankment".

SC-16 EMERGENCY CALLS

The Contractor shall provide the Owner with the phone numbers of at least three responsible persons, to be used during non-working hours and weekends, who shall be in a position to dispatch labor and equipment to the project in the event of an emergency.

SC-17 EXISTING UTILITIES

Prior to the start of construction, the Contractor shall contact Utilities Protection Center at (800) 282-7411 to determine the location of all existing underground utilities in accordance with the General Provisions. The location of the existing underground utilities shown on the Contract Drawings are approximate and shall be verified by the Contractor.

SC-18 OWNER'S RIGHT TO EXISTING MATERIALS AND EQUIPMENT

All existing material and equipment required to be removed, replaced, or demolished under this contract shall become the property and responsibility of the Contractor and may be salvaged at their discretion, with the exception of items listed in the Section, entitled "Demolition" which shall remain in the Owner's property and at no additional cost to the contract.

SC-19 QUALIFICATIONS OF BIDDER

In addition to requirements described in the Information for Bidders, Contractors will be required to show evidence of a suitable license to perform work in the Commonwealth of Kentucky before their bids will be considered. The Owner will consider, in determining the qualifications of a bidder, their record in the performance of any contracts for the construction work into which they may have entered with any public bodies or corporations; the Owner expressly reserves the right to reject the bid of such bidder if such record discloses that such bidder, in the opinion of the Owner, has not properly performed such contracts or has

habitually and without just cause neglected the payment of bills, or has otherwise discarded his obligations to subcontractors, vendors, or employees.

The apparent low bidders will be required to submit a qualification statement providing suitable evidence indicating that the bidder has the capabilities to perform classes of work contemplated, that the bidder has satisfactorily performed similar work elsewhere, and that the bidder has the necessary plant and sufficient capital to execute the work properly.

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

Within ten days of Bid opening date, the three lowest bidders shall provide the following information (additional information may be requested):

- Financial data
- Experience
- Equipment and personnel available
- List of previous, similar projects
- References

SC-20 SITE CONDITIONS AND CONDITIONS OF WORK

The Contractor must acquaint themselves thoroughly as to the character and nature of the work to be done. The Contractor furthermore must make a careful examination of the site of the work and inform themselves fully as to the difficulties to be encountered in the performance of the work, the facilities for delivering, storing and placing materials and equipment, and other conditions relating to construction labor.

The Contractor assumes all risk as to the nature and behavior of the soil or subsurface conditions which underlie the work or is adjacent thereto, or difficulties that may be due to any unfavorable conditions that may be encountered in the work, whether apparent on surface inspection or disclosed after construction begins.

No plea of ignorance of conditions that exist or may hereafter exist on the site of the work, or difficulties that may be encountered in the execution of the work as a result of failure to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill, in every detail, all the requirements of the Contract Documents and to complete the work for the consideration set forth therein, or as a basis for any claim whatsoever.

Insofar as possible, the Contractor, in carrying out his work must employ such methods or means as will not cause interruption of or interference with the work of the Owner or any separate Contractor.

This Contract includes excavation of the unclassified basis. The cost of all excavation required under this Contract will be merged into the base bid. No distinction will be made insofar as payment is concerned between earth and rock.

SC-21 CONDITIONS AFFECTING THE WORK

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve them from responsibility for successfully performing the work without additional expense. The Owner and Engineer assume no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the

execution of this Contract, unless such understanding or representations by the Owner or Engineer are expressly stated in the Contract.

SC-22 LEAD-BASED PAINT

The possibility exists for surfaces encountered during the work to contain lead-based paint. For the purpose of this bid the Contractor shall assume all efforts to comply and to perform work in accordance with applicable state and federal laws, rules and regulations related to worker safety, including but not limited to OSHA and Health Standard for Occupational Exposure to Lead in Construction Work.

SC-23 EXAMINATION OF RECORDS

The Contractor agrees that the Owner, or any duly authorized representative, shall, until the expiration of three (3) years after final payment hereunder, have access to and the right to examine and copy any directly pertinent books, documents, papers and records of the Contractor involving transactions related to this Contract.

The Contractor further agrees to include in any subcontract for more than \$10,000 entered into as a result of this Contract, a provision to the effect that subcontractor agreed that the Owner or any duly authorized representative shall, until the expiration of three (3) years after final payment under the subcontract, have access to and the right to examine and copy any directly pertinent books, documents, papers and records of such Contractor involving transactions related to such subcontractor, or this Contract. The term subcontract as used herein shall exclude subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

The period of access provided in subparagraphs above for records, books, documents and papers which may relate to any arbitration, litigation or the settlement of claims arising out of the performance of this Contract or any subcontract shall continue until any appeals, arbitration, litigation, or claims shall have been finally disposed of.

SC-24 RODENT AND PEST CONTROL

The Contractor shall at all times keep the work area, including the storage areas, free from rodents, noxious pests, and other vermin.

The Owner or the Engineer shall notify the Contractor on any non-compliance with this requirement and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the non-compliance and the corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to eliminate the rodents, pests or vermin and the causes thereof promptly, the Owner may have the necessary extermination work performed and charge the cost to the Contractor.

SC-25 ACCURACY OF DRAWINGS

The Contractor shall have sole responsibility for field verifying existing equipment, piping, appurtenances and structure locations and dimensions prior to ordering, fabrication and installation of equipment, piping, appurtenance and materials. The Contractor shall conform to the Drawings as closely as possible and exercise care to secure approved headroom and space conditions, neat arrangements of equipment, piping, valves, hangers and like items to overcome interferences with the existing conditions.

SC-26 DISSEMINATION OF CONTRACT INFORMATION

The Contractor shall not publish, permit to be published, or distribute for public consumption, any information, or written, concerning the results or conclusions made pursuant to performance of this Contract without the prior written consent of the Engineer. (Two copies of any material proposed to be published or distributed shall be submitted to the Engineer).

SC-27 MODEL NUMBERS FOR EQUIPMENT, MATERIALS OR SYSTEMS

Model or series numbers listed for a particular piece of equipment, material or system establishes minimum standards for operation and quality. Additional requirements and standards maybe defined by the Specifications, and furnishing the listed model or series does not relieve the Contractor or Manufacturer from the responsibility of satisfying all requirements and standards set forth in the Specifications.

SC-28 EQUIPMENT OPERATION AND MAINTENANCE MANUALS

The Contractor shall submit equipment O&M manuals in accordance with the General Provisions. Where O&M Manuals are specified to be submitted, six (6) copies shall be provided. At least one copy of the O&M Manual shall be an original. Retainage on Pay Requests will not be reduced until the Engineer has approved the O&M Manuals required for the work. The content of each manual shall provided in accordance with the following checklist:

1. General
 - a. Three-ring binder (8 ½" x 11") with cover sheet including:
 - (1) Functional Name
 - (2) Manufacturer
 - (3) Specific Location Installed
 - (4) Model & Serial Numbers
 - b. Table of Contents with sections in the O&M tabbed
 - c. Sheet with Name, Address, Phone Number and E-mail Address of:
 - (1) Local Supplier
 - (2) Factory
 - (3) Contractor
 - d. All Purchase Order Numbers
 - e. Bill of Materials
 - f. Drawings larger than 11" x 17" (blueprints, shop drawings) neatly folded in clear plastic vinyl pockets
2. Operation Portion
 - a. Brief description of equipment/system/controls
 - b. Principle components identified
 - c. Normal starting procedure
 - d. Normal stop procedure
 - e. Emergency stop procedure
 - f. Equipment test procedures
 - g. Alarm silence procedure/overload reset procedure
 - h. Programming procedure/recommended settings
 - i. Assistance telephone number
3. Maintenance Portion
 - a. Detailed assembly drawings
 - b. Detailed parts list with unique part numbers
 - c. Spare parts list
 - d. Lubrication schedules/requirements
4. Complete set of previously "Reviewed" Shop Drawings
5. The Contractor (Manufacturers) shall supply complete equipment O&M information in electronic format (DOC or PDF, in rich text format (searchable)) for equipment specified in Divisions 11 and 14.

SC-29 VIDEO RECORDING DURING EQUIPMENT OPERATIONS TRAINING

The Owner reserves the right to video record all training sessions involving the Owner's operations staff during the training periods conducted by the equipment manufacturer as specified in the Contract Documents. Videotapes of these training sessions will be used for the sole purpose of training and educating the Owners' operations staff.

SC-30 REQUIREMENTS FOR PROFESSIONAL ENGINEER'S LICENSE

Where the Contract Documents include requirements for certain shop drawing submittals to be prepared by a professional engineer licensed in the Commonwealth of Kentucky, the Engineer may consider a waiver of the licensing requirements specifically for the Commonwealth of Kentucky provided that said professional engineer is licensed and in good standing with the licensing board in a U.S. state outside the Commonwealth of Kentucky. Such waiver shall not relieve the professional engineer from complying with applicable design codes and standards specific to the Commonwealth of Kentucky.

SC-31 FIELD TESTING AND FACILITY STARTUP

I. GENERAL

A. This Special Provision includes:

1. Requirements for sequencing of the various field testing described in the Contract Specifications, including sequencing of testing described in this Special Provision.
2. Requirements for documentation prior to performance of system testing.
3. Requirements for developing a detailed plan for and conducting clean water system testing and/or dry system testing.
4. Requirements for startup performance period.
5. Requirements for scheduling of training

B. Requests for deviations from the test sequencing and testing described herein may be provided by the Contractor to the Engineer. Such requests shall be made in writing, and shall be accepted by the Engineer prior to implementation.

C. Prior to startup activity the contractor shall verify that: systems are tested hydraulically, mechanically, and electrically; systems which require calibration, commissioning, and balancing are fully certified as complete and perform in accordance with the Contract Documents; and that the required tagging and identification is complete.

D. Contractor shall verify to the Engineer in writing that the potable water components have been disinfected in accordance with AWWA Specifications C651, C652 and C653. These requirements apply equally to new facilities and components and to existing components into which connections have been made.

E. The Contractor shall schedule the start-up a minimum of 30 days prior to the start-up date with a written notice issued to, but not necessarily limited to Owner and Engineer and sub-contractors.

II. TEST SEQUENCING

A. Field testing shall be performed in accordance with the Contract Documents. Testing shall be performed in the sequence described herein. Each test shall be clearly identified on the Contractor's work schedule. Work schedule shall include line items for each piece of equipment and system that will be tested, and each type of test to be performed.

B. Testing shall be performed within the phasing and sequencing listed herein. Tests specified

in the Contract Documents that are not listed in one of the phases described herein are not required to be performed in any particular order or phase, but shall be performed in accordance with the requirements of the individual specification section. Tests associated with equipment required for operation of equipment or systems listed herein shall be performed as prerequisites regardless of whether or not such tests are listed in the testing sequence specified herein. Tests listed in the same phase may be performed concurrently where approved by the Engineer. No testing in a particular phase may be performed until all testing in prior phases have been completed and approved by the Engineer. Before proceeding to testing in the next phase, all discrepancies and deficiencies observed during the tests in the previous phase shall be noted and corrected, and, if directed by the Engineer, the test of equipment and systems previously found deficient shall be rescheduled and repeated at no additional cost to the Owner. The Contractor shall provide written notification to the Engineer a minimum of seven (7) calendar days prior to beginning the next phase of testing. Tests shall be performed by phase in the following sequence:

SC-32 PAYMENTS TO CONTRACTOR

Owner shall pay Contractor as set forth in the General Provisions of the Contract Documents, Section 11, as amended by these Special Conditions.

At least ten (10) days before each progress payment falls due (but not more often than once a month) the CONTRACTOR will submit to the ENGINEER a partial payment estimate filled out and signed by the CONTRACTOR covering the WORK performed during the period covered by the partial payment estimate and supported by such data as the ENGINEER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the WORK but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the Owner's title to the material and equipment and protect his interest therein including applicable insurance. The ENGINEER will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the OWNER, or return the partial payment estimate to the CONTRACTOR indicating in writing his reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER within ten (10) days of presentation to him of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate.

SC-33 AS-BUILT DRAWINGS

As-built drawings shall be delivered to the Engineer and approved prior to submittal of final request for payment.

SC-34 PERFORMANCE AND PAYMENT BONDS

100% performance and 100% payment bonds are required and they must be valid for one year beyond the date of acceptance of the completed project.

SC-35 SUBMITTALS

Submittals must bear the approval stamp of the Contractor prior to submittal.

SC-36 BLASTING

Blasting is not permitted.

SC-37 SUBSURFACE CONDITIONS

Rock may be encountered during construction of this project. The cost of rock excavation is to be included in the price for other items of construction and no additional payment for rock excavation will be made. The Contractor shall be responsible for inspecting the site and must satisfy himself as to the existing subsurface conditions.

The presence of rock shall be considered a usual physical condition, ordinarily encountered and generally recognized as inherent in the work described in the Contract Documents.

SC-38 SEWER AND POTABLE WATER LINES

All sewer and potable water lines will maintain a horizontal separation of 10 feet and a vertical separation of 18 inches.

SC-39 EROSION AND SEDIMENT CONTROL

The contractor shall take positive steps to minimize siltation and erosion during the project as per the Erosion and Sedimentation Control Plan. All erosion and sedimentation control measures must be installed prior to initiation of construction activity. In addition, all erosion and sedimentation control measures must comply with the applicable regulations in the Commonwealth of Kentucky. Erosion and sediment control measures shown on the Plans are minimum requirements. Contractor shall provide additional measures as may be required to be in compliance at all times with local and state laws.

SC-40 QUALITY CONTROL TESTING

Contractor will perform his own quality control testing at his own expense. The Owner may perform testing to check the Contractor's work but such tests shall not be used by the Contractor for quality control and such tests shall not relieve the Contractor from obligations to perform the work in accordance with the Specifications and Contract Documents.

In the event that any test is performed by the Owner which in the opinion of the Engineer indicates failure of the work to meet the specifications, the Contractor shall promptly correct the work and reimburse the Owner for the costs of all subsequent tests until the work has been corrected.

The Contractor will be responsible for taking all samples and concrete cylinders requested by the Engineer and delivery of same to a testing laboratory selected by the Owner.

Unless specifically stated otherwise in individual Sections of the Specifications or Drawings, the Contractor shall provide test results within 48 hours of test completion.

- END OF SECTION -

DIVISION 01

GENERAL REQUIREMENTS

SECTION 011000**SUMMARY****PART 1 - GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
1. Work covered by the Contract Documents.
 2. Sequence of Operations.
 3. Utility Shutdowns
 4. Temporary Systems
 5. Use of premises.
 6. Specification formats and conventions.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Contractor shall provide all material, services, labor, tools and equipment, necessary to construct this project. The following is a brief description of the major work items included in the contract:

The program of work for Contract No. 1 which bids are to be submitted consists of the installation of approximately 26,000 LF of 6", 3" and 2" water main and appurtenances, replacement of one booster pump station and one fixed generator at the new booster pump station.

1.03 SEQUENCE OF OPERATIONS

Refer to Section 011213

1.04 UTILITY SHUTDOWNS

- A. One-week advance notice to the Owner is required prior to commencing any work that will require the temporary shutdown of normal tank performance unless of an emergency in nature.
- B. Length of shutdowns on the existing system should be pre-determined before construction by owner, engineer, and contractor.

1.05 TEMPORARY SYSTEM (S)

- A. All temporary water lines and hoses shall be depressurized and all temporary electrical lines and equipment de-energized when not in use and at the end of each workday.

1.06 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Division and Sections using the Master Format 2016 division format.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

- END OF SECTION -

SECTION 011213**WORK SEQUENCE****PART 1 - GENERAL****1.01 WORK INCLUDED**

The Contractor shall submit to the Engineer for review and acceptance a complete schedule of his proposed sequence of construction operations and payment prior to commencement of work. However, the Engineer shall not accept a construction schedule that fails to utilize the entire time allocated for the construction of the water system extension. This schedule requirement in no way prevents the Contractor from completing the project in a shorter time frame than scheduled. The construction schedule shall be submitted and approved by the Owner prior to the submittal of the first partial payment request. A revised construction schedule shall be submitted with every subsequent partial payment request. This revised schedule must be approved by the Owner prior to payment.

1. Western Mason Water District shall determine construction sequence.
2. Locate all existing valves and make sure they are workable.
3. Notify the Western Mason Water District a minimum of 48 hours prior to connecting into any existing line.
4. Install new water main using extreme caution not to damage existing water lines or services.

The final approved construction schedule shall keep the existing water main in service until the new water main has been installed, pressure tested, flushed, sterilized and sampled. Once the new water main has been put into service then existing water services can be reconnected one at a time. Once all the services have been reconnected to the new main, then the existing water main can only then be abandoned by cut and plug. The existing water main must be kept in service until all meter reconnects are completed and all branch lines have been reconnected.

1.02 RELATED WORK

- A. Section 011000 - Summary of Work.

1.03 ADDITIONAL INFORMATION

Any delays caused by the Contractor shall be at his expense and at no cost to the Owner or Engineer.

- END OF SECTION -

SECTION 011260**OCCUPANCY****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. The Contractor shall be aware that after each major portion of the project is completed, the Contractor shall notify the Engineer that those specific operations are complete and prior to replacing that portion of the work into service shall request an interim inspection of the work to be returned to or placed into service.
- B. The interim inspection requested by the Contractor shall not preclude or supersede the final inspection of the project or reduce the Contractor's responsibility for the completed portion prior to final acceptance of the work by the Owner.
- C. The Contractor shall provide all necessary temporary controls and other items required for operation of all work placed into service prior to final acceptance as required. At such time as new controls, etc. are complete and functioning, the Contractor shall remove all temporary installed items.

- END OF SECTION -

SECTION 011400
GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESIGNATION OF PARTIES

- A. All references in the Specifications, Contract Documents and Drawings to "Owner" shall mean **Western Mason Water District, 2573 Mary Ingles Highway, Dover, Kentucky 41034**; all references to "Engineer" shall mean **Bluegrass Engineering, PLLC, 222 East Main Street, Suite 1, Georgetown, Kentucky 40324**.

1.02 EXPERIENCE CLAUSE

- A. Wherever experience is required of equipment manufacturers in manufacturing or in records of satisfactory operation for a specified period of time, in lieu of the experience, the manufacturer may furnish a 100 percent (100%) performance guarantee bond or a cash deposit. The bond or cash deposit provided by the manufacturer shall guarantee replacement of the equipment process in the event of failure or unsatisfactory service. The period of time for which the bond or cash deposit is required shall be the same as the experience period of time specified.

1.03 ACCESS TO INSPECTION OF WORK

- A. Representatives of the State Department of Health, the State Department for Natural Resources and Environmental Protection, local public health agencies, Owner, and Engineer shall at all times have full access to the project site for inspection of the work accomplished under this Contract and for inspection of all materials intended for use under the Contract. The Contractor shall provide proper facilities for such access and inspection.

1.04 PRE-CONSTRUCTION CONFERENCE

- A. The Contractor, Engineer and Owner, or their duly appointed representative, shall meet in a preconstruction conference prior to the initiation of construction to organize, schedule and determine responsibilities for the work as it pertains to each party of the Contract.

1.05 CONSTRUCTION SCHEDULE CHART

- A. Prior to start of any construction, the Contractor shall furnish a construction schedule or progress chart. The schedule or chart shall be subject to the approval of the Engineer, and be of sufficient detail to show the chronological relationship of all activities of the project, the order in which the Contractor proposes to carry on the work, estimated starting and completion dates of major features, procurement of materials, and scheduling of equipment. The schedule shall be in a form suitable for appropriately indicating the percentage of work scheduled for completion at any time. The schedule shall be kept current and shall reflect

completion of all work under the Contract within the specified time and in accordance with these Specifications.

1.06 CONSTRUCTION PROGRESS MEETINGS

- A. Monthly construction progress meetings shall be held at the project site or at a designated location established by the Owner. The Contractor, appropriate Sub-Contractors, the Engineer and the Owner shall meet to review construction progress, equipment or material submittals, construction schedules, etc.

1.07 PRECONSTRUCTION PHOTOGRAPHS

- A. Prior to construction and mobilization of equipment, Contractor shall take record photographs of all areas of the project site.
- B. In lieu of photographs, a videographic record may be made of the project site.

1.08 CLEANING

- A. The Contractor shall at all times keep the construction site and the surrounding area presentable to the public, and clean of rubbish caused by the Contractor's operation. At completion of the work, the Contractor shall remove all the rubbish, all tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the site clean and ready for use.
- B. After completion of all work and before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of the piping, equipment and all associated fabrication.
- C. All waste and excess materials shall be disposed of off the project site and at no additional expense to the Owner. In no case shall waste materials (any removed concrete, piping, equipment, etc.) be buried on the site. Burning is not permitted.
- D. Upon completion of the project, the Contractor is responsible for leaving the project site in as good as or better condition than the original. This includes site grading, landscaping, replacement of sidewalks, driveways, curbs, mailboxes, clotheslines, fences, etc. and removal of all construction debris.

1.09 TAXES

- A. Proposals shall be made to include any applicable taxes on payrolls, materials, equipment, vehicles, utilities, etc., including State sales taxes and shall include compensation for such taxes on all work under this Contract.

1.10 COMPLIANCE WITH SAFETY REGULATIONS

- A. The equipment items furnished shall comply with all governing federal and state laws regarding safety, including all current requirements of the Occupational Safety and Health Act (OSHA). Contractor shall be solely responsible for job safety in accordance with all laws, regulations, methods, etc. of OSHA and the state.

1.11 OBSTRUCTIONS

- A. In cases where storm sewers, sanitary sewers, gas lines, water lines, telephone lines, electric lines or other underground structures are encountered, they shall not be displaced or molested unless necessary, in which case they shall be replaced in as good a condition as found and as quickly as possible.
- B. The Contractor is responsible for notifying the appropriate utility companies, and coordinating the protection of the utility. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense, unless in the opinion of the Engineer, such damage was caused through no fault of the Contractor.

1.12 STORAGE FACILITIES

- A. The Contractor shall be responsible for proper and adequate storage of all materials and equipment used on the site. Any additional off-site space required for construction purposes shall be the Contractor's responsibility to obtain.
- B. Upon completion of the work, the Contractor shall remove all storage facilities, surplus materials and equipment and restore the site to its original condition, or to the finished condition as required by the Contract.

1.13 STANDARDS OF WORKMANSHIP

- A. Work of all crafts and trades shall be laid out to lines and elevations as established by the Contractor from the Drawings or from instructions by the Engineer. Unless otherwise shown, all work shall be plumb and level, in straight lines and true planes, parallel or square to the established lines and levels. The work shall be accurately measured and fitted to tolerance as established by the best practices of the crafts and trades involved, and shall be as required to fit all parts of the work carefully and neatly together.

1.14 PERFORMANCE AND PAYMENT BONDS

- A. Performance and payment bonds, as specified in of the General Conditions, shall run for a period of one (1) year after final acceptance of the work by the Owner. These bonds shall be executed on the forms provided as a part of the Contract Documents.

1.15 INITIAL START-UP AND OPERATION

- A. The initial operation period provided for herein is to check and provide the satisfactory mechanical operation of the facilities. These requirements for start-up and operation in no way relieve the Contractor of his responsibility with respect to guaranty of work as specified in the "General Conditions." The manufacturer's representatives shall be present during this period to instruct the operators in the care, operation and maintenance of the equipment. When the shakedown period is completed, the Owner will assume responsibility for maintenance and operation, provided that all major items of the Work are operating satisfactorily.

- B. If any or all of the facilities are not operating satisfactorily at the end of the shakedown period, the Contractor shall continue to maintain those facilities that are incomplete or not operating satisfactorily until they are complete and acceptable to the Owner. Maintenance by the Contractor shall include all mechanical facilities such as pumps and like equipment. Prior to start-up, the Contractor will be required to prepare an operating schedule detailing the proposed start-up and his plans for manpower and auxiliary facilities to be provided.

1.16 GUARANTY

- A. Except as otherwise specified herein, the Contractor shall guarantee all work from latent defects in materials, equipment and workmanship for one (1) year from the date of final completion of the Contract. The date of final completion shall be that date upon which the final estimate is approved by the Owner or the date of substantial completion as defined in Section 01 77 00 of the technical Specifications. In case any date but the date of final completion is established to govern the time of the Guaranty, such date shall be duly recorded together with the terms and conditions of such agreement.
- B. The Contractor agrees that he will obtain from the manufacturers of equipment and materials furnished under this Contract, guarantees against defective materials and workmanship, and if those guarantees furnished by the manufacturer do not extend for the term of one (1) year from and after the date upon which the final estimate is formally approved by the Owner or other established date as set forth hereinbefore, he shall make the necessary arrangements and assume all cost for extending this guarantee for the required period.
- C. The Contractor shall promptly make such repairs or replacement as may be required under the above specified guarantee, and, when the repairs or replacements involve one or more items of installed equipment, shall provide the services of qualified factory-trained servicemen in the employ of the equipment manufacturers to perform or supervise the repairs or replacements.
- D. When the Engineer or the Owner deems it necessary, and so orders, such replacements or repairs under this section shall be undertaken by the Contractor within twenty-four (24) hours after service of notice. If the Contractor unnecessarily delays or fails to make the ordered replacements or repairs within the time specified, or if any replacements or repairs are of such nature as not to admit of the delay incident to the service of a notice, then the Owner shall have the right to make such replacements or repairs, and the expense thereof shall be paid by the Contractor or deducted from any moneys due the Contractor.
- E. The Performance Bond shall remain in full force and effect throughout the Guaranty period.
- F. All warranties and guarantees remaining in effect at and beyond the Guaranty expiration date shall be relinquished and transferred to the Owner. Copies of such warranty/guaranty shall be submitted to the Engineer prior to date of the start of the guaranty period.

1.17 TRAFFIC CONTROL AND MAINTENANCE

- A. Traffic shall be maintained on all highways and streets at all times during construction of pipe lines across or along side said highways and streets. Access

to all existing subdivisions and private residences shall also be kept open. Work shall be performed in accordance with applicable City, County, and State Department of Transportation guidelines. Traffic control shall include proper signing and flagging per these guidelines.

- B. Traffic shall be maintained in accordance with the Manual on Uniform Traffic Control Devices. Work shall include all labor and materials necessary for construction and maintenance of traffic control devices and markings.
- C. Traffic control shall also include all flag persons and traffic control devices such as, but not limited to, flashers, signs, barricades and vertical panels, plastic drums (steel drums will not be permitted) and cones necessary for the control and protection of vehicular and pedestrian traffic as specified by the Manual on Uniform Traffic Control Devices.
- D. Any temporary traffic control items, devices, materials, and incidentals shall remain the property of the Contractor when no longer needed.
- E. The Contractor shall maintain a two-lane traveled way with a minimum lane width of 10 feet; however, during working hours, one-way traffic may be allowed at the discretion of the Engineer, provided adequate signing and flagpersons are at the location.
- F. The Contractor shall fully cover with plywood any signs, either existing, permanent or temporary, which do not properly apply to the current traffic phasing, and shall maintain the covering until the signs are applicable or are removed.
- G. In general, all traffic control devices shall be placed starting and proceeding in the direction of the flow of traffic and removed starting and proceeding in the direction opposite to the flow of traffic.
- H. The Engineer and Contractor shall review the signing before traffic is allowed to use lane closures, crossovers, or detours, and all signing shall be approved by the Engineer before work can be started by the Contractor.
- I. If traffic should be stopped due to construction operations and an emergency vehicle on an official emergency run arrives on the scene, the Contractor shall make provisions for the passage of that vehicle immediately.

1.18 PROTECTION OF VEGETATION

- A. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

(Not Applicable)

- END OF SECTION -

SECTION 012200

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, equipment, service, other necessary supplies and perform all work, including all excavation, backfilling, & cleanup (without additional compensation, except where specifically set out in these specifications) at the unit or lump sum prices for the following items.

1.02 PROGRESS AND PAYMENTS SCHEDULES

- A. Contractor shall submit to Engineer a construction schedule upon execution of the AGREEMENT. Construction schedule shall show work completed in dollars versus contract time.
- B. Within ten (10) days after the date of formal execution of the CONTRACT AGREEMENT, the Contractor shall prepare and submit to the Engineer a periodic estimate which depicts the Contractor's cost for completing the contract requirements to be used as a basis for the periodic payments. The Contractor's periodic estimate must be approved by the Engineer before any payments will be made on this contract.
- C. The Engineer's decision as to sufficiency and completeness of the Contractor's periodic estimate will be final.
- D. The Contractor must make current, to the satisfaction of the Engineer, the periodic estimate each time he requests a payment on this contract.
- E. The Contractor's construction schedule and periodic estimate must be maintained at the construction site available for inspection and shall be revised to incorporate approved change orders as they occur.
- F. When the Contractor requests a payment on this contract, it must be on the approved periodic estimate and be current. Further, the current periodic estimate shall be submitted for review and approval by the Engineer before monthly payments will be made by the Owner. The Contractor shall submit six (6) current copies of the periodic when requesting payment.

1.03 CONDITIONS FOR PAYMENT

- A. The Owner will make payments for acceptable work in place and materials properly stored on-site. The value of payment shall be as established on the approved periodic estimate, EXCEPT the Owner will retain five percent (5%) of the work in place and a percentage as hereinafter listed for items properly stored or untested.
- B. No payment will be made for stored materials unless a proper invoice from the supplier is attached to the pay request. Further, no item whose value is less than \$1,000 will be considered as stored materials for pay purposes.
- C. Payment for stored materials that are submitted with each monthly pay request will require documentation from the material supplier indicating that those items have been paid. Proof of payment for stored materials shall be in the form of "paid invoice" receipts or cancelled

checks. Failure to provide adequate documentation will result in delays in processing subsequent pay requests.

- D. Payment for pipeline items shall be limited to eighty percent (80%) of the bid price until the pipeline items have been tested and clean up has been completed and accepted by the Engineer.
- E. Payment for equipment items shall be limited to eighty-five percent (85%) of their scheduled value (materials portion only) until they are set in place. Eighty-five percent (85%) for stored materials and equipment shall be contingent on proper on-site storage as recommended by the manufacturer or required by the Engineer.
- F. Payment for equipment items set in place shall be limited to ninety percent (90%) of their scheduled value until they are ready for operation and have been certified by the manufacturer. Ninety percent (90%) payment for installed equipment shall be contingent on proper routine maintenance of the equipment in accordance with the manufacturer's recommendations.
- G. Payment for equipment items set in place and ready for operation shall be limited to ninety-five percent (95%) of their scheduled value until all acceptance tests have been completed and the required manufacturer's pre-startup operator's training has been completed.
- H. Payment for the labor portion of equipment items will be subject only to the degree of completeness and the appropriate retainage.
- I. The retainage shall be an amount equal to 5% of said estimate. The retainage on the equipment items shall be 5% as defined hereinbefore.
- J. If at any time thereafter when the progress of the WORK is not satisfactory or determine that the Contractor is not making satisfactory progress, additional amounts may be retained.

1.04 DETERMINATION OF THE VALUE OF EXTRA (ADDITIONAL) OR OMITTED WORK

- A. The value of extra (additional) or omitted work shall be determined in one or more of the following ways:
 - 1. On the basis of the actual cost of all the items of labor (including on-the-job supervision), materials and use of equipment, plus a maximum 20% for added work or a minimum 20% for deleted work which shall cover the Contractor's general supervision, overhead and profit. In case of subcontracts, the sum of total overhead amounts of the subcontractors and Contractor, plus total profit amounts for the subcontracts and Contractor shall not exceed 25% of the cost. Subcontractors shall be limited to 15% and Contractors shall be limited to 10% for combined overhead and profit. The cost of labor shall include required insurance, taxes and fringe benefits. Contractor to provide detailed breakdown of all cost as justification of change in work. Equipment costs shall be based on current rental rates in the areas where the work is being performed, but in no case shall such costs be greater than the current rates published by the Associated Equipment Distributors, Chicago, Illinois.
 - 2. By estimate and acceptance in a lump sum.
 - 3. By unit prices named in the Contract or subsequently agreed upon.
- B. Provided, however, that the cost or estimated cost of all extra (additional) work shall be determined in advance of authorization by the Engineer and approved by the Owner.

- C. All extra (additional) work shall be executed under the conditions of the original Contract. Any claim for extension of time shall be adjusted according to the proportionate increase or decrease in the final total cost of the work unless negotiated on another basis.
- D. Except for over-runs in contract unit price items, no extra (additional) work shall be done except upon a written change Order from the Engineer, and no claim on the part of the Contractor for pay for extra (additional) work shall be recognized unless so ordered in writing by the Engineer.
- E. Change Orders to the construction contract must comply with DOW Procurement Guidance for Construction and Equipment Contracts. Contract requires cost, pricing, and certification for change orders exceeding \$25,000 as required by DOW Procurement Guidance for Construction and Equipment Contracts.

PART 2 – PRODUCTS

2.01 NEW WATER MAIN

Payment for installing **NEW WATER MAIN** will be made at the contract unit price per linear foot, complete in place, which shall include compensation for furnishing pipe, trenching (including rock excavation), earth or Class I material bedding, thrustblocking, earth backfill, fittings, grip rings, crushed stone for gravel driveways, crushed stone for asphalt driveways, asphalt replacement, disinfecting, clean up and restoration of all disturbed areas, including seeding and mulching as required, testing, sampling, chlorination and all appurtenances required. Also included are all costs associated with traffic control. The quantity of water mains to be paid for shall be the length of the completed line as measured along its centerline without any deduction for lengths of fittings, valves or other appurtenances. **No ditches shall be left open at the end of each work day unless permission is granted by the engineer.**

2.02 TAPPING SLEEVE AND VALVE

Payment for **TAPPING SLEEVE AND VALVE** at the location listed shall include all materials and labor necessary for making a connection to the existing water main as shown on the plans. Payment will be made per connection. It shall include any fittings, valve, tapping sleeve, and box to make a complete installation.

2.03 CUT AND PLUG EXISTING WATER MAIN

Payment for **CUTTING AND PLUGGING EXISTING WATER MAIN** shall include all materials and labor necessary for completing the disconnection of the existing water line. This will be paid per cut and plug and will include piping, mechanical joint cap, grip rings, concrete blocking and other appurtenances required to complete the installation. Size of the piping will be paid as one price and will not be differentiated.

2.04 GATE VALVE & BOX

Payment for **GATE VALVES** shall be made at the contract unit price per installation for the various sizes. This work shall include valve boxes with lids, and valve markers, for furnishing materials, hauling, trenching (including rock excavation), bedding, laying, jointing, backfilling, concrete supports and concrete valve box protector ring with copper locate pin.

2.05 FLUSH HYDRANT ASSEMBLY

Payment for **FLUSH HYDRANT ASSEMBLIES** shall be made at the unit price, complete in place, which shall include all 6" hydrants, piping, fittings, gate valve and valve box and cover, 6 feet of

connecting pipe, concrete blocking and supporting pad, drainage bed, stainless steel all thread rods and nuts, wrenches, and all other materials and labor necessary to complete the installation.

2.06 STEEL CASING BORE AND JACK

Payment for **STEEL CASING, BORE & JACK** shall be paid for at the contract unit price per linear foot of steel encasement pipe for the various sizes and types. This work shall include the encasement pipe, complete in place with fittings, spacers, end seals, skids, blocking, line markers on each side of crossed roadway, and all items necessary for its construction and installation. Carrier pipe is paid separately under item 2.01. The casing pipe shall be as noted in Section 330507, 2.02 Casing Pipe and shall apply to all railroads, state, county, city, and/or private roadways and driveways.

No payment shall be made for failed bore paths or incomplete installations.

2.07 UNDERGROUND BLOW OFF ASSEMBLY

Payment for the **UNDERGROUND BLOW OFF ASSEMBLY** as shown on the standard details will be paid as a unit price and include the gate valve, valve box, fittings, pipe, concrete pad, cap and any other items to make a complete installation. All sizes will be paid the same.

2.08 OPEN CUT CASING

Payment for water mains crossing major creeks or streams shall include excavation, rock excavation, concrete, rip-rap, crushed stone, gravel backfill, anchors, PVC/Steel casing pipe (whichever one is called for on the contract drawings), spacers and end seals. The length of the creek crossing to be paid for shall be measured from end to end of the encasement pipe. Where casing is required the carrier pipe shall be Yelomine® or approved equal and shall be paid separately under item 2.01.

2.09 ADDITIONAL SERVICE TUBING

Payment for additional polyethylene service pipe and fittings installed in open trench and backfilled will be made per linear foot in place. Payment for concrete, crushed stone, bituminous and concrete drives; sidewalk repair or replacement is included in the contract unit price for "service tubing." Excavation is unclassified and included in this item.

2.10 CONNECTION TO EXISTING WATER MAIN

Payment for connecting to an existing water main at the location listed shall include all materials and labor necessary for making a connection to the existing water main as shown on the plans. Payment will be made per connection and will include tees, grip rings, thrust blocks, fittings and a maximum of 20 LF pipe. Valves at dry tie-ins will be paid separately under the gate valve price.

2.11 AIR RELEASE VALVE ASSEMBLY

Payment for a 3/4" air release valve will be made at the contract unit price each, complete in place, including all excavation, material, meter box, saddles, fittings, ball valves, backfilling, and labor necessary to complete to complete the installation.

2.12 DIRECTIONAL DRILL WATER MAIN

Payment for water mains drilled as called for on the construction plans shall include excavation, HDPE pipe, drilling, chemicals, water, and any other items that are deemed necessary to make a complete and workable installation. Directional drill may also include creek crossings. Please note that all HDPE pipe shall have fused Mechanical Joint Adapters. **Payment will be made based on the distance listed on the plans. If it is thought additional footage may be required, it shall be considered in the unit price bid. No additional footage will be paid.**

2.13 NEW CUSTOMER SERVICE

Payment will be made per complete installation to include saddle, corporation stop, copper service tubing (appropriate size), single or tandem setter, $\frac{3}{4}$ " pressure reducing valve (if applicable), meter box and lid, excavation, valve, casing pipe (if applicable) and all items necessary for a complete installation. Services to be placed five (5) feet inside the customer's property line including a two (2) foot stub out with female adapter on customer side of meter box. Same side services shall include a maximum of twenty-five (25) feet of service line. Opposite side services shall also include a maximum of one hundred twenty-five (125) feet of service line and all costs of boring or pushing the service line.

The service meter will be provided by the low bid contractor on Contract 2 of the System Improvements Project and installed by same for Contract 2. The service meter main body shall be of high grade bronze, with hinges, single lid cover and raised characters cast on the body indicating the direction of flow. Meter shall have a working pressure rating of 150 psi. The register shall be straight reading gallon type. The register unit shall be hermetically sealed, and driven by permanent magnets. The register shall have a center sweep hand and a test circle shall be divided into 100 equal parts and include a flow finder. The register shall carry a minimum 10-year warranty.

The meters shall be manufactured by **Master Meter Radio Read**. The entire unit is to be pre-assembled in a workmanlike manner with all components fitted snugly into the box and fastened to prevent movement. All joints shall be sealed with Teflon tape. The inlet and outlet is to be equipped with compression couplings. **ALL MASTER METER RADIO READ METERS TO BE PROVIDED BY AND INSTALLED BY LOW BID CONTRACTOR ON CONTRACT 2 OF SYSTEM IMPROVEMENTS PROJECT.**

2.14 MINERVA BOOSTER PUMP STATION

The pump station work will be paid as a lump sum and shall include the following: materials, labor, taxes, bonds, and insurance. The work shall be completed in place as shown on the construction drawings and shall adhere to the contents of these specifications. The replacement price will also include but is not limited to the following: Exterior piping, gate valves, and connections, meter and meter box, concrete floor, strainer, 15 HP pumps, motors, control panel, VFD's, heater, valves, painting, site piping, interior piping, grip rings, fittings, seeding, clean-up, permits, site work, drain piping, fencing, gravel, electric, insulation, roofing, siding, concrete block, rebar and other building materials, and all other items necessary for a complete installation as shown in the plans and specifications. The existing RTU shall be reconnected to the new pump.

2.15 FIXED GENERATOR AT NEW MINERVA BPS

The fixed generator at the new Minerva BPS shall include furnishing, setting in place, and conducting the required start-up services for a permanently mounted backup generator and other appurtenances at the District's Minerva BPS site and other work for a complete installation, as shown on the Drawings and described in the Specifications. Additionally, a 500 gallon propane tank to be installed near the generator. Both installations shall include installation of a concrete pad(s).

Payment for the fixed generator at the new Minerva BPS will be made at the unit price established in Section 004100 – Bid Form, complete in place which shall include all required concrete work, electrical, generator, transfer switch, propane tank and related appurtenances. The Contractor will be reimbursed for the actual cost based on approved invoices of the Fixed Generator at New Minerva BPS with this established unit price.

2.16 CLEAN UP AND RESTORATION OF DISTURBED AREAS

Payment for clean up and restoration of disturbed areas will be made at the unit price already established in Section 004100 – Bid Form, complete in place which shall include clean up and restoration of all disturbed areas, including seeding and mulching as required.

(NOTE: All rock excavation, crushed stone bedding, and asphalt replacement shall be included in the per unit price for pipe. No additional payment will be provided for these items)

PART 3 - EXECUTION

3.01 PAY ITEMS

- A. The pay items listed herein before refer to the items listed in the Bid Schedule and cover all of the pay items under the base bid for this contract.
- B. Any and all other items of work listed in the specifications or shown on the Contract Drawings for this contract shall be considered incidental to and included in those pay items.

3.02 QUANTITIES OF ESTIMATE

- A. Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents, including the Bid Proposal, they are given for use in comparing bids and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract, and such increase or diminution shall not give cause for claims or liability for damages. The Engineer will not be financially responsible for any omissions from the Contract Documents and therefore not included by the Contractor in his proposal.
- B. Aerial photographs utilized for plan sheets in the Contract Documents are indicated at an approximate scale and shall not be scaled for quantity take-offs. The pipeline quantities listed in the Bid Schedule are given for use in comparing bids and may not be the actual quantities to be installed. It is the Contractor's responsibility to field verify the length and quantities of pipeline to be installed prior to the ordering of materials. Payment on unit price contracts are based on actual quantities installed. The Owner or Engineer will not be financially responsible for any shortage of pipe or overrun of pipe ordered for the pipeline quantities.
- C. The actual quantities of all materials to be used for this project shall be field verified prior to the Contractor ordering the necessary materials. The quantity listed in the bid schedule is given for use in comparing bids and may increase or diminish as may be deemed necessary or as directed by the Owner. Any such increase or diminution shall not give cause for claims or liability for damages. The Engineer or Owner will not be financially responsible for any charges incurred for restocking of materials ordered.

- END OF SECTION -

UNIT PRICES

SECTION 012500**PRODUCTS AND SUBSTITUTIONS****PART 1 - GENERAL****1.01 DESCRIPTION OF REQUIREMENTS**

- A. General: Substitution of materials and/or equipment is defined in Paragraph 6.7.1 of the General Conditions and more fully hereinafter.
- B. Definitions: Definitions used in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents including such terms as "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction" and similar terms. Such terms are self-explanatory and have recognized meanings in the construction industry.
1. "Products" are items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the project or taken from the Contractor's previously purchased stock. The term "product" as used herein includes the terms "material", "equipment", "system" and other terms of similar intent.
 2. "Named Products" are products identified by use of the manufacturer's name for a product, including such items as a make or model designation, as recorded in published product literature, of the latest issue as of the date of the Contract Documents.
 3. "Materials" are products that must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form units of work.
 4. "Equipment" is defined as a product with operational parts, regardless of whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.
- C. Substitutions: The Contractor's requests for changes in the products, materials, equipment and methods of construction required by the Contract Documents are considered requests for "substitutions", and are subject to the requirements specified herein. The following are not considered as substitutions:
1. Revisions to the Contract Documents, where requested by the Owner, Engineer are considered as "changes" not substitutions.
 2. Substitutions requested during the bidding period, which have been accepted prior to the Contract Date, are included in the Contract Documents and are not subject to the requirements for substitutions as herein specified.
 3. Specified Contractor options on products and construction methods included in the Contract Documents are choices available to the Contractor and are not subject to the requirements for substitutions as herein specified.
 4. Except as otherwise provided in the Contract Documents, the Contractor's determination of and compliance with governing regulations and orders as issued by governing authorities do not constitute "substitutions" and do not constitute a

basis for change orders.

- D. Standards: Refer to Division-01 section "Definitions and Standards" for applicability of industry standards to the products specified for the project, and for acronyms used in the text of the specification sections.

1.02 RELATED DOCUMENTS

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

1.03 SUBMITTALS

The information required to be furnished for evaluation of product substitution will be as follows:

- A. Performance capabilities, and materials and construction details will be evaluated based upon conformance with the Specifications. Products that do not conform with the Specification shall not be accepted.
- B. Manufacturer's production and service capabilities, and evidence of proven reliability will be acceptable if the following is furnished.
 1. Written evidence that the manufacturer has not less than (3) years experience in the design and manufacture of the substitute product.
 2. Written evidence of at least one application, of a type and size similar to the proposed substitute product, in successful operation in a wastewater treatment plant for a period of at least one year.
 3. In lieu of furnishing evidence of a manufacturer's Experience and successful operation of an application of the product to be substituted, the Contractor has the option of furnishing a cash deposit or bond which will guarantee replacement if the product the furnished does not satisfy the other requirements specified in this section. The amount of each deposit or bond will be subject to the approval.
- C. Specific reference to characteristics either superior or inferior to specified requirements will be evaluated based on their net effect on the project. Products with any characteristics inferior to those specified will not be acceptable unless offset by characteristics that, in the opinion of the Engineer, will cause the overall effect of the product on the project to be at least equal to that of those specified.

1.04 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.
- B. Compatibility of Options: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract Documents, but must be provided by the Contractor.
- C. The detailed estimate of operating and maintenance costs will be evaluated based on comparison with similar data on the specified products. Proposed substitute products

which have an operating and maintenance cost that, in the opinion of the Engineer, exceeds that of the specified products will not be considered equal and will not be acceptable.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control delivery schedules to minimize long-term storage at the site and to prevent overcrowding of construction spaces. In particular coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.

- A. Deliver products to the site in the manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
- B. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
- C. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT COMPLIANCE

- A. General: Requirements for individual products are indicated in the Contract Documents; compliance with these requirements is in itself a Contract Requirement. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods. These methods include the following:
 - 1. Proprietary.
 - 2. Descriptive.
 - 3. Performance.
 - 4. Compliance with Reference Standards.

Compliance with codes, compliance with graphic details, allowances, and similar provisions of the Contract Documents also have a bearing on the selection process.

- B. Procedures for Selecting Products: Contractor's options in selecting products are limited by requirements of the Contract Documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects.

2.02 SUBSTITUTIONS

- A. Conditions: Contractor's request for substitution will be received and considered when extensive revisions to the Contract Documents are not required, when the proposed changes are in keeping with the general intent of the Contract Documents, when the request are timely, fully documented and properly submitted, and when one or more of the following conditions is satisfied, all as judged by the Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.
 - 1. The Engineer will consider a request for substitution where the request is directly

related to an "or equal" clause or similar language in the Contract Documents.

2. The Engineer will consider a request for substitution where the specified product or method cannot be provided within the Contract Time. However, the request will not be considered if the product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly or to coordinate the various activities properly.
 3. The Engineer will consider a request for substitution where the specified product or method cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 4. The Engineer will consider a request for a substitution where a substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Engineer for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
 5. The Engineer will consider a request for substitution when the specified product or method cannot be provided in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.
 6. The Engineer will consider a request for substitution when the specified product or method cannot be properly coordinated with other materials in the work, and where the Contractor certifies that the proposed substitution can be properly coordinated.
 7. The Engineer will consider a request for substitution when the specified product or method cannot receive a warranty as required by the Contract Documents and where the Contractor certifies that the proposed substitution receive the required warranty.
 8. The Contractor shall reimburse the Owner any costs for review by the Engineer of proposed product substitutions which require major design changes, as determined by the Owner, to related of adjacent work made necessary by the proposed substitutions.
- B. Work-Related Submittals: Contractor's submittal of and the Engineer's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of the Contract Documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

2.03 GENERAL PRODUCT REQUIREMENTS

- A. General: Provide products that comply with the requirements of the Contract Documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
1. Standard Products: Where they are available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

2. Continued Availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Owner at a later date.
- B. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project.
1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.
 2. Equipment Nameplates: Provide permanent nameplate on each item of service-connected or power operated equipment. Locate the nameplate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.
 - a. Name of manufacturer
 - b. Name of product
 - c. Model number
 - d. Serial number
 - e. Capacity
 - f. Speed
 - g. Ratings

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. General: Except as otherwise indicated in individual sections of these Specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at Time of Acceptance.

- END OF SECTION -

SECTION 013113
PROJECT COORDINATION

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

Minimum administrative and supervisory requirements necessary for coordination of work on the project include but are not necessarily limited to the following:

- A. Coordination and meetings.
- B. Limitations for use of site.
- C. Coordination of crafts, trades and subcontractors.
- D. General installation provisions.
- E. Cleaning and protection.
- F. Conservation and salvage.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.03 COORDINATION AND MEETINGS

- A. Monthly general project coordination meetings will be held at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Representation at each meeting by every party currently involved in coordination or planning for the work of the entire project is requested. Meetings shall be conducted in a manner which will resolve coordination problems. Results of the meeting shall be recorded and copies distributed to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.04 LIMITATIONS ON USE OF THE SITE

- A. Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements, allocation of available space shall be administered equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

1.05 COORDINATION OF CRAFTS, TRADES AND SUBCONTRACTORS

- A. The Contractor shall coordinate the work of all the crafts, trades and subcontractors engaged on the work, and he shall have final responsibility as

regards the schedule, workmanship and completeness of each and all parts of the work.

- B. All crafts, trades and subcontractors shall be made to cooperate with each other and with others as they may be involved in the installation of work which adjoins, incorporates, precedes or follows the work of another. It shall be the Contractor's responsibility to point out areas of cooperation prior to the execution of subcontractor agreements and the assignment of the parts of the work. Each craft, trade and subcontractor shall be made responsible to the Owner, for furnishing embedded items and giving directions, for doing all cutting and fitting and making all provisions for accommodating the work, and for protecting, patching, repairing and cleaning as required to satisfactorily perform the work.
- C. The Contractor shall be responsible for all cutting, digging and other action of his subcontractors and workmen. Where such action impairs the safety or function of any structure or component of the project, the Contractor shall make such repairs, alterations and additions as will, in the opinion of the Engineer, bring said structure or component back to its original design condition at no additional cost to the Owner.
- D. Each subcontractor is expected to be familiar with the General Requirements and all sections of the detailed Specifications for all other trades and to study all Drawings applicable to his work including Architectural and Structural Drawings, to the end that complete coordination between trades will be effected. Consult with the Engineer if conflicts exist on the Drawings.
- E. Special attention shall be given to points where ducts or piping must cross other ducts or piping, where lighting fixtures must be recessed in ceilings and where ducts, piping and conduits must fit into walls and columns. It shall be the responsibility of such subcontractor to leave the necessary room for other trades.
- F. No extra compensation will be allowed to cover the cost of removing piping, conduit, ducts, etc., or equipment found encroaching on space required by others.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

- END OF SECTION -

SECTION 013323**SHOP DRAWINGS, PRODUCT DATA, & SAMPLES****PART 1 - GENERAL****1.01 DESCRIPTION OF REQUIREMENTS**

- A. General: This section specifies procedural requirements for non-administrative submittals including shop drawings, product data, samples (when samples are specifically requested) and other miscellaneous work-related submittals. Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.
- B. Refer to other Division-01 sections and other Contract Documents for Specifications on administrative, non-work-related submittals. Such submittals include, but are not limited to the following items:
1. Permits.
 2. Payment applications.
 3. Performance and payment bonds.
 4. Insurance certificates.
 5. Inspection and test reports.
 6. Schedule of values.
 7. Progress reports.
 8. Listing of subcontractors.
 9. Operating and Maintenance Manuals
- C. Engineer prefers initial submittals be in electronic media along with one paper copy for review. Engineer utilizes Newforma software and will provide Contractor with the necessary links and instructions for submittal purposes. Upon completion of the review process, Contractor shall print two (2) copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.
- If Contractor does not have capability to submit electronic submittals, then Contractor shall submit a request to Engineer for waiver. In the event a waiver is granted, paper submittals shall be provided as directed by the Engineer.
- D. Submittals shall be checked and reviewed by the Contractor and stamped with Contractor's review stamp before submission to the Engineer. The review of the submittals by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittals will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.
- E. All Requests for Information (RFI) to Engineer shall be submitted electronically via Engineer's Newforma software.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to work of this section.

1.03 DEFINITIONS

A. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

1. Fabrication and installation drawings.
2. Setting diagrams.
3. Shopwork manufacturing instructions.
4. Templates.
5. Patterns.
6. Coordination drawings (for use on site).
7. Schedules.
8. Design mix formulas.
9. Contractor's engineering calculations.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

B. Product data includes standard printed information on manufactured products that has not been specially-prepared for this project, including but not limited to the following items:

1. Manufacturer's product specifications and installation instructions.
2. Standard color charts.
3. Catalog cuts.
4. Roughing-in diagram and templates.
5. Standard wiring diagrams.
6. Printed performance curves.
7. Operational range diagrams.
8. Mill reports.
9. Standard product operating and maintenance manuals.

C. Samples, where specifically required, are physical examples of work, including but not limited to the following items:

1. Partial sections of manufactured or fabricated work.
2. Small cuts or containers of materials.
3. Complete units of repetitively-used materials.
4. Swatches showing color, texture and pattern.
5. Color range sets.
6. Units of work to be used for independent inspection and testing.

D. Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories, including, but not limited to the following:

1. Specially-prepared and standard printed warranties.
2. Maintenance agreements.
3. Workmanship bonds.
4. Survey data and reports.
5. Testing and certification reports.
6. Record drawings.
7. Field measurement data.

1.04 SUBMITTAL PROCEDURES

- A. General: Refer to the General Conditions and Paragraph 1.1 hereinbefore for basic requirements for submittal handling.
- B. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

It is the Contractor's responsibility to make such field measurements as are needed to base submittals on actual field conditions to assure proper connection, fit, function and performance of all work and equipment in the execution of the contract work.

Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

- C. Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.
- D. Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.
 - 1. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.
 - 2. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.
- E. Submittal Preparation: Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of Architect/Engineer.
 - 4. Name and address of Contractor.
 - 5. Name and address of subcontractor.
 - 6. Name and address of supplier.
 - 7. Name of manufacturer.
 - 8. Number and title of appropriate specification section.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Similar definitive information as necessary.
- F. All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable drawing(s) or drawing schedule(s). Include only one item in a submittal.

- G. The Contractor shall review and check submittals, and shall indicate his review by initials and date. Any submittal received without this evidence of review shall be returned to the Contractor without review.
- H. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer in writing of the deviation and the reasons therefore.
- I. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender "without action".
- J. Electronic Submittals: If the electronic method of submittals is agreed to by Contractor, Engineer, and Owner, the format and procedures will be determined and implemented prior to any submittals. Submittals will be processed through "Newforma" software. Each item of the submittal documents shall be in .pdf format and shall be oriented so that they are read from upper left corner to lower right corner, with no rotation of said document being required after receiving it. The .pdf file shall be named so that it describes the item being submitted. All other requirements herein are part of the electronic submittal process with the exception of the duplicate copies. Contractor stamp indicating review and any comments or notes must be on the .pdf submittal.

1.05 SPECIFIC SUBMITTAL REQUIREMENTS

- A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings. Where applicable, show fabrication, layout, setting and erection details.

Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop drawings illustrate some portion of the work and show fabrication, layout, setting or erection details of equipment, materials and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for his distribution plus four (4) which will be retained by the Engineer. Shop drawings shall be folded to an approximate size of 8-1/2" x 11" and in such manner that the title block will be located in the lower right-hand corner of the exposed surface.
- B. Project data shall include manufacturer's standard schematic drawings modified to delete information which is not applicable to the project, and shall be supplemented to provide additional information applicable to the project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the project.
- C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.
- D. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.

- E. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the technical Specifications.
- F. Submittals for all electrically operated items (including instrumentation and controls) shall include complete size, color coding, all terminations and connections, and coordination with related equipment.
- G. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the Contractor shall be responsible for insuring the compatibility of such coatings with the field-applied paint products and systems.
- H. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.
- I. Where manufacturers brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.
- J. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.
- K. All bulletins, brochures, instructions, parts lists, and warranties package with and accompanying materials and products delivered to and installed in the project shall be saved and transmitted to the Owner through the Engineer.

1.06 REVIEW STATUS

- A. Submittals will be returned, stamped with the following classifications: "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected", or "Submit Specified Item".
- B. In some instances, corrections to dimensions or clarification notations will be required, in which case the drawings will be marked "Furnish as Corrected." These shop drawings will not be required to be resubmitted for further approval. If the supplier makes additional modifications after receiving a "Furnish as Corrected" disposition, the drawings must then be resubmitted for review.
- C. If the shop drawing is returned with the notation "Revise and Resubmit", the Contractor shall promptly make the revisions indicated and repeat the submittal approval procedure.
- D. If the shop drawing is returned with the notation "Submit Specified Item", this indicates that the submittal does not meet the specification, will not be reviewed, and is unacceptable. Upon return of a drawing so marked, the Contractor shall repeat the initial approval procedure, submitting acceptable materials or equipment.
- E. The "Rejected" notation is used to indicate materials or equipment that are not acceptable and are not included in the project.

1.07 REMINDER OF CONTRACTOR RESPONSIBILITIES

- A. Verify field measurements, field construction criteria, catalog numbers, and similar data.
- B. Coordinate each submittal with requirements of work and of Contract Documents.

- C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.
- D. Begin no work, and have no material or products fabricated or shipped which requires submittals until return of submittals with Engineer's stamp and initials or signature indicating review.
- E. Upon review and close-out of a submittal, Contractor shall print two (2) copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.
- F. It is emphasized that the review of shop drawings by the Engineer is for general conformance to the Contract Drawings and Specifications, but subject to the detailed requirements of the Contract Drawings and Specifications. Although the Engineer may check submitted data in more or less detail, such checking is an effort to discover errors and omissions in the Contractor's drawings and to assist the Contractor in coordinating and expediting his work, but shall in no way relieve the Contractor of his obligation and responsibility to properly coordinate the work, and to Engineer the details of the work in such a manner, that the purpose and intent of the Contract will be achieved nor shall any such detailed checking by the Engineer be construed as placing on him or on the Owner, any responsibility for the accuracy, proper fit, functioning or performance of any phase of the work included in this Contract. The Contractor is responsible for confirmation and correlation of dimensions at the job site; for information that pertains solely to the fabrication processes or to the techniques of construction; for the coordination of the work of all trades; and for performance of his work in a safe and satisfactory manner.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

(Not Applicable)

END OF SECTION

SECTION 013800**CONSTRUCTION PHOTOGRAPHY AND VIDEO****PART 1 - GENERAL****1.01 WORK INCLUDED**

The Contractor shall be responsible for digitally recording the entire project site both prior to construction and immediately after completion and acceptance of all work. Photographs shall be taken by CONTRACTOR during all phases of construction activities. DVD shall be produced by a videographer acceptable to the Engineer and of a professional quality.

1.02 DVD

The DVD shall be of a high quality recording and saved in a format readily used. DVDs shall show the time, date, and project location on screen during playback.

1.03 PHOTOGRAPHS

All photographs shall be provided as prints and digital format to the ENGINEER and OWNER.

1.04 SUBMITTALS

The Contractor shall provide two copies of the project DVD with jackets. Both the photographs and DVD's and jackets shall be clearly labeled with project name start date and completion date as shown below.

Project Name and Contract No.
Owner Name
Start Date: _____
Completion Date: _____

-END OF SECTION-

SECTION 014500
QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.01 QUALITY CONTROL

- A. Work of all crafts and trades shall be laid out to lines and elevations as established by the Contractor from the Drawings or from instructions by the Engineer.
- B. Unless otherwise shown, all work shall be plumb and level, in straight lines and true planes, parallel or square to the established lines and levels. The Work shall be accurately measured and fitted to tolerance as established by the best practices of the crafts and trades involved, and shall be as required to fit all parts of the Work carefully and neatly together.
- C. All equipment, materials and articles incorporated into the Work shall be new and of comparable quality as specified. All workmanship shall be first-class and shall be performed by mechanics skilled and regularly employed in their respective trades.

1.02 TESTS, INSPECTIONS, AND CERTIFICATIONS OF MATERIALS

- A. Tests, inspections and certifications of materials, equipment, subcontractors or completed work, as required by the various sections of the Specifications shall be obtained by the Contractor and all costs shall be included in the Contract Price.
- B. The Contractor shall submit to the Engineer the name of testing laboratory to be used.
- C. Contractor shall deliver written notice to the Engineer at least 24 hours in advance of any inspections or tests to be made at the Project site. All inspections, tests, samples for water quality or other procedures requiring the Engineer to attest to be conducted in the field shall be done in the presence of the Engineer or his representative.
- D. Certifications by independent testing laboratories may be by copy of the attestation(s) and shall give scientific procedures and results of tests. Certifications by persons having interest in the matter shall be by original attest properly sworn to and notarized.

1.03 RELATED DOCUMENTS

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

1.04 SUBMITTALS

- A. General: Refer to Section 013323 for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer.
- B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:
 - 1. Name of testing agency or test laboratory.
 - 2. Dates and locations of samples and tests or inspections.
 - 3. Names of individuals making the inspection or test.

4. Designation of the work and test method.
5. Complete inspection or test data.
6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.
9. Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract Documents.
10. Recommendations on retesting, if applicable.

1.05 RESPONSIBILITIES

- A. Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.
- B. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related Work with the requirements of the Contract Documents, then retests are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original Work.
- C. Responsibility for Associated Services: The Contractor is required to cooperate with the independent performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:
 - Providing access to the work.
 - Taking samples or assistance with taking samples.
 - Delivery of Samples to test laboratories.
 - Delivery and protection of samples and test equipment at the project site.
- D. Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the Work. In addition, the Contractor and each independent testing agency shall coordinate their Work so as to avoid the necessity of removing and replacing Work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. Upon completion of inspection, testing, sample taking and similar services performed on

the Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect Work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

- END OF SECTION -

SECTION 015000**TEMPORARY FACILITIES AND CONTROLS****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall make his own provisions for temporary electricity and water and maintain strict supervision of use of temporary utility services as follows:
 - 1. Enforce compliance with applicable standards.
 - 2. Enforce safety practices
 - 3. Prevent abuse of services.
 - 4. Pay all utility charges required.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. The Contractor shall obtain and pay for all permits as required by governing authorities.
- B. Obtain and pay for temporary easements required across property other than that of Owner or that is shown on the Contract Drawings.
- C. The Contractor shall comply with applicable codes.

1.03 REMOVAL

- A. The Contractor shall completely remove temporary materials, equipment, and offices upon completion of construction.
- B. The Contractor shall repair damage caused by installation and restore to specified or original condition.

1.04 TEMPORARY LIGHTING

- A. The Contractor shall furnish and install temporary lighting required for:
 - 1. Construction needs.
 - 2. Safe and adequate working conditions.
 - 3. Public Safety.
 - 4. Security lighting.
 - 5. Temporary office and storage area lighting.
- B. Service periods for safety lighting shall be as follows:
 - 1. Within construction area: All times that authorized personnel are present.
 - 2. Public areas: At all times.

- C. Costs of Installation and Preparation: Contractor shall pay all installation, maintenance and removal costs of temporary lighting.
- D. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the General Contractor.

1.05 TEMPORARY WATER

The Contractor shall provide the water necessary for testing and disinfection. The Contractor shall supply his own hoses, chlorine for disinfection, etc. The Owner will make available water to the Contractor at the current wholesale rate for water per 1,000 gallons.

1.06 SANITARY FACILITIES

Contractor shall provide sanitary facilities as set forth in General Provisions (GP-2.04. Sanitary Regulations).

1.07 FIELD OFFICE

The Contractor shall make his own provisions for providing the electricity, telephone, gas, water, sewer, and other utilities to his office trailer that are required or as necessary for completion of the work.

The Contractor shall be responsible for all utility charges.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 IMPLEMENTATION

- A. The Contractor shall provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to storm drains, adjacent areas and walkways prior to the start of any site work.
- B. Straw bale dikes, silt fencing and synthetic filter fabric shall be used as necessary to protect adjacent lands, surface waters, and vegetation to achieve environmental objectives.
- C. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Soil deposited on pavement by construction and other contractor vehicles shall be removed and the pavement swept as required.
- E. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- F. Minimize amount of bare soil exposed at one time.
- G. Provide temporary measures such as berms, dikes, drains, hay bales, gabions, etc., as

directed by the Engineer so as to minimize siltation due to runoff.

- H. Construct fill and waste areas by selective placement to avoid erosive exposed surface of silts or clays.
- I. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

3.02 OPERATION AND MAINTENANCE

- A. The Contractor shall inspect, repair, and maintain erosion and sediment control measures until final stabilization has been established.

3.03 REMOVAL OF FACILITIES

- A. The Contractor shall remove the temporary facilities after final stabilization has been established. Used devices (including old straw bales) shall be disposed of as Construction & Demolition debris.

3.04 DUST CONTROL

- A. Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

- END OF SECTION -

SECTION 015400

SECURITY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide barricades, lanterns and other such signs and signals as may be necessary to warn of the dangers in connection with open excavation and obstructions.

B. Provide an adequate and approved system to secure the Project area at all times, especially during non-construction periods; the Contractor shall be solely responsible for taking proper security measures.

1.02 COSTS

Contractor shall pay all costs for protection and security systems.

- END OF SECTION -

SECTION 015500**ACCESS ROADS AND PARKING AREAS****PART 1 - GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Access roads.
- B. Parking.
- C. Existing pavements and parking areas.
- D. Permanent pavements and parking areas.
- E. Maintenance.
- F. Removal, resurfacing.

PART 2 - PRODUCTS**2.01 MATERIALS**

For temporary construction: Contractor's option.

PART 3 - EXECUTION**3.01 ACCESS ROADS**

- A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load-bearing capacity to provide unimpeded traffic for construction purposes.
- B. Construct temporary bridges and/or culverts to span low areas and allow unimpeded drainage.
- C. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.
- D. Locate temporary access roads as approved by the Owner and/or the Engineer.

3.02 PARKING

The Contractor shall construct temporary parking areas to accommodate use of construction personnel in the area.

3.03 REMOVAL, REPAIR

- A. Remove temporary materials and construction when permanent facilities are usable, as directed by the Engineer.
- B. Repair existing permanent facilities damaged by usage to original and/or specified condition.

- END OF SECTION -

SECTION 015600

BARRIERS

PART 1 - GENERAL

1.01 WORK INCLUDED

Temporary Railing: Temporary railing shall be provided around open pits and other locations where needed, to prevent accidents or injury to persons.

1.02 COST

The Contractor shall pay all costs for temporary railing.

- END OF SECTION -

SECTION 015700
TRAFFIC REGULATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Construction parking control.
- B. Flagmen.
- C. Flares and lights.
- D. Haul routes.
- E. Traffic signs and signals.
- F. Removal.

1.02 RELATED REQUIREMENTS

- A. Section 01530 - Barriers.
- B. Section 01580 - Project Identification and Signs.

PART 2 - PRODUCTS

2.01 SIGNS, SIGNALS AND DEVICES

- A. Post-mounted and wall-mounted traffic control and informational signs as specified and required by local jurisdictions.
- B. Automatic Traffic Control Signals: As approved by local jurisdictions.
- C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
- D. Flagman Equipment: As required by local jurisdictions.

PART 3 - EXECUTION

3.01 CONSTRUCTION PARKING CONTROL

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

3.02 TRAFFIC CONTROL

A. Whenever and wherever, in the Engineer's opinion, traffic is sufficiently congested or public safety is endangered, Contractor shall furnish uniformed officers to direct traffic and to keep traffic off the highway area affected by construction operations.

B. Contractor shall abide by City regulations governing utility construction work.

C. Traffic control shall be provided according to the Kentucky Department of Highways Manual on Uniform Traffic Control Devices for Streets and Highways.

3.03 FLAGMEN

Provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.04 FLARES AND LIGHTS

Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.05 HAUL ROUTES

A. Consult with authorities, establish public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.06 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install appropriate signs at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.

C. Relocate as work progresses, to maintain effective traffic control.

3.07 REMOVAL

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

- END OF SECTION -

SECTION 016000
MATERIAL AND EQUIPMENT

PART 1 - GENERAL**1.01 COMPLIANCE WITH SAFETY REGULATIONS**

The equipment items furnished shall comply with all governing Federal and State laws regarding safety, including all requirements of the Occupational Safety and Health Act of 1970 (OSHA).

PART 2 - PRODUCTS**2.01 REFERENCES**

A. General Provisions: Section 10 Correction and Guarantee of Work, Section 13 Materials and Equipment.

B. Section 331413 – Water Distribution Piping

C. Section 331419 – Valves & Hydrants

D. All material shall meet applicable American Water Works Association (AWWA), American Standard Testing Methods (ASTM), Underwriters Laboratories (UL), Factory Mutual (FM), National Sanitation Foundation (NSF) standards.

WESTERN MASON WATER DISTRICT

The following is a list of manufacturers for the materials that may be provided on the project. All material shall meet applicable AWWA, ASTM, Underwriters Laboratories, and Factory Mutual standards. The Owner and Engineer shall approve actual materials during shop drawing review.

MATERIAL/ITEM	APPROVED MANUFACTURER
Air Release Valve (Water and Sewer)	Apco, ARI, Primer Corp or Approved Equal
All Brass Fittings (AWWA brass)	Ford
Aluminum Hatch	Bil-Co or Approved Equal
Blowoff Hydrant Assembly	M & H Style 33 Post Hydrant
Blowoff Assembly (Underground)	Hydrants shall be Gil Industries Post Hydrant or Approved Equal.
Bolted Cast Couplings	Ford FC3 Series or Approved Equal
Brass Nipples and Pipe	State Origin
Brass Service Saddles	Ford S70 Series
Butterfly Valves (Class 150)	M & H Style 4500 or Approved Equal

MATERIAL/ITEM	APPROVED MANUFACTURER
Butterfly Valves (Class 250)	M & H Style 4500 or Approved Equal
Casing Spacers	State Origin
Check Valve	Valve shall be those manufactured by Mueller, Kennedy, American Flow Control, or Approved Equal.
Control Valve	n/a
Copper Tracing Wire 12 AWG	State Origin
Customer Individual Pressure Reducing Valve	Wilkins #600 LUSC 70 DM or Approved Equal
Customer Meter	Master Meter Radio Read
Customer Meter Box	18x24 Ultra Rib Box or Approved Equal
Customer Meter Box Cover	Pro Source AMR Lid or Approved Equal
Customer Meter Setter	Ford VBHC72-9W-44-33-Q
DI and Cast Iron Full Body Tapping Sleeves	Mueller, Clow, US Pipe, American Flow or Approved Equal or Approved Equal
DI Double Strap Service Saddles	Ford FB202 Series or Approved Equal
DI Pipe Class 350	Griffin, Clow, US Pipe, American DI Pipe or Approved Equal
Dual Disc Check Valve	Watts 709 or Approved Equal.
Fire Hydrant	Mueller® Super Centurion 250 ® Model A-423 or Approved Equal
Flushing Hydrant Assembly	Mueller® – Super Centurion 250, Model No. A-423 or Approved Equal
Full Circle Repair Clamps (all stainless steel)	Mueller, Smith & Blair, Ford, Powerseal, Cascade or Approved Equal
Galvanized Compression Couplings	Smith & Blair, Dresser, JCM, Powerseal or Approved Equal
Gate Valves	Mueller Resilient Seat or Approved Equal
Generator	Generac or Approved Equal
High Density Polyethylene Pipe	Flying W Plastic or Approved Equal
Individual Pressure Reducing Valve	Watts Model No. N55BUM1 or Approved Equal
Mainline Pressure Reducing Valve	n/a
MJ Fittings Compact/Full Body MJ Packs	McWayne (Tyler/Union, Clow), Griffin, US Pipe, American DI Pipe or Approved Equal
PVC Couplings	JM Manufacturing, Harrington, Multi-Fittings or Approved Equal
PVC Pipe Class 250 or C900	Diamond, JM Manufacturing, Napco, Freedom, ETI, National, Pioneer or Approved Equal
Restraint Joint Collar Fittings	Mueller, McWayne, Ford, EBBA or Approved Equal

MATERIAL/ITEM	APPROVED MANUFACTURER
Service Tubing – Polyethylene Tubing (CTS Service Tubing)	Domestic
Steel Tapping Valves and Sleeves (Check Working Pressure)	Mueller, Kennedy, Ford or Approved Equal
Underground Detectable Tape	Shall be Lineguard brand encased aluminum foil, Type III. The identification tape is manufactured by Lineguard, Inc., P. O. Box 426, Wheaton, IL 60187 or Approved Equal
Underground Tracer Wire Anchor System	Valve Box Protector Ring w/copper locator pin

-END OF SECTION-

SECTION 016100
TRANSPORTATION AND HANDLING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Handling and Distribution:

1. The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the work, as necessary or required; shall provide suitable and adequate storage room for materials and equipment during the progress of the work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by him, until the final completion and acceptance of the work.
2. Storage and demurrage charges by transportation companies and vendors shall be borne by the Contractor.

B. Storage of Materials and Equipment: All excavated materials and equipment to be incorporated in the work shall be placed so as not to injure any part of the work or the existing facilities and so that free access can be had at all times to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

- END OF SECTION -

SECTION 017100**CLEANING****PART 1 - GENERAL****1.01 WORK INCLUDED**

A. During its progress the work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes, structures, by work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.

C. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organics in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.

D. The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors, and on completion of the work shall deliver it undamaged and in fresh and new appearing condition.

E. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition equal or better than that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

1.02 DESCRIPTION

A. Related Requirements Specified Elsewhere:

1. Project Closeout: Section 01700.
2. Cleaning for Specific Products or Work: Specification Section for that work.

B. On a continuous basis, maintain premises free from accumulations of waste, debris, and rubbish, caused by operations.

C. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.

1.03 SAFETY REQUIREMENTS

- A. Hazards Control:
 - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
 - 2. Prevent accumulation of wastes, which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- B. Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on Project site without written permission from the Owner.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or fuel in open drainage ditches or storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute cleaning to ensure that grounds and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to minimize blowing dust.
- C. At reasonable intervals during progress of Work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off construction site.
- F. The Contractor shall thoroughly clean all materials and equipment installed.

3.02 FINAL CLEANING

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. In preparation for substantial completion, conduct final inspection of project area(s).
- C. Broom clean paved surfaces; rake clean other surfaces of grounds.
- D. Maintain cleaning until Project, or portion thereof, is accepted by Owner.

- END OF SECTION -

SECTION 017400
WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Related requirements specified elsewhere:
 - 1. Bid Bond: Instructions to Bidders.
 - 2. Performance and Payment Bonds: General Conditions.
 - 3. Guaranty: General Conditions.
 - 4. General Warranty of Construction: General Conditions.
 - 5. Project Closeout: Section 01700.
 - 6. Warranties and Bonds required for specific products: As listed herein.
 - 7. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.
 - 8. Operating and Maintenance Data: Section 01730.

1.02 SUBMITTALS REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Furnish two (2) original signed copies.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product, equipment or work item.
 - 2. Firm name, address and telephone number.
 - 3. Scope
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service and maintenance contract.
 - 6. Provide information for Owner's personnel:

- a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
7. Contractor name, address and telephone number.

1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 in. x 11 in., punch sheets for 3-ring binder: Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project
 - b. Name of Contractor
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.04 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during progress of construction: Submit documents within 10 days after inspection and acceptance.
- B. Otherwise, make submittals within 10 days after date of substantial completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

1.05 SUBMITTALS REQUIRED

Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications.

- END OF SECTION -

SECTION 017800
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall obtain from the Engineer, one (1) set of prints of the Contract Drawings. These prints shall be kept and maintained in good condition at the project site and a qualified representative of the Contractor shall enter upon these prints, from day-to-day, the actual "as-built" record of the construction progress. Entries and notations shall be made in a neat and legible manner and these prints shall be delivered to the Engineer upon completion of the construction. APPROVAL FOR FINAL PAYMENT WILL BE CONTINGENT UPON COMPLIANCE WITH THIS PROVISION.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

- A. SECTION 013323 – SHOP DRAWINGS
- B. SECTION 007213 - GENERAL CONDITIONS

1.03 MAINTENANCE OF DOCUMENTS

- A. Maintain at job site, one copy of:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Reviewed Shop Drawings
 - 5. Change Orders
 - 6. Other Modifications to Contract
- B. Store documents in approved location, apart from documents used for construction.
- C. Provide files and racks for storage of documents.
- D. Maintain documents in clean, dry legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by Engineer and Owner.

1.04 MARKING DEVICES

Provide colored pencil or felt-tip marking pen for all marking.

1.05 RECORDING

- A. Label each document "PROJECT RECORD" in 2-inch high printed letters.

- B. Keep record documents current.
- C. Do not permanently conceal any work until required information has been recorded.
- D. Contract Drawings: Legibly mark to record actual construction:
 - 1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - 2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - 3. Field changes of dimension and detail.
 - 4. Changes made by Change Order or Field Order.
 - 5. Details not on original Contract Drawings.
- E. Specifications and Addenda: Legibly mark up each Section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Change Order or Field Order.
 - 3. Other matters not originally specified.
- F. Shop Drawings: Maintain as record documents; legibly annotate Shop Drawings to record changes made after review.

1.06 SUBMITTAL

- A. At completion of project, deliver record documents to Engineer.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
 - 1. Date.
 - 2. Project Title and Number.
 - 3. Contractor's Name and Address.
 - 4. Title and Number of each Record Document.
 - 5. Certification that each Document as Submitted is Complete and Accurate.
 - 6. Signature of Contractor, or his authorized Representative.

- END OF SECTION

DIVISION 03

CONCRETE

SECTION 031100
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
- B. Openings for other affected work.
- C. Form accessories.
- D. Stripping forms.

1.02 RELATED WORK

- A. SECTION 031500 – EXPANSION & CONTRACTION JOINTS
- B. SECTION 032100 – REINFORCEMENT BARS
- C. SECTION 033000 – CAST-IN-PLACE CONCRETE

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 347 - Recommended Practice for Concrete Formwork.
- C. PS 1 - Construction and Industrial Plywood.
- D. ACI 318 - Building Code Requirements for Reinforced Concrete.
- E. Field Reference Manual, ACI Publication SP-15.
- F. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

1.04 SYSTEM DESCRIPTION

- A. Design, engineer, and construct formwork, shoring, bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, dimensions, and tolerances.

1.05 QUALITY ASSURANCE

- A. Construct and erect concrete formwork in accordance with ACI 301 and 347, latest revisions. Contractor shall maintain a copy of these standards, or Publication SP-15 in the field at all times.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Plywood; APA Plyform, Class 1; sound, undamaged sheets with straight edges.
- B. Forms shall be sufficiently rigid to prevent displacement or sagging between supports, and so constructed that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for their adequacy.
- C. For surfaces to be given rubbed finish, the form in contact with the concrete shall be made of plywood, metal, metal framed plywood faced, or other acceptable panel-type materials, to provide continuous straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize the number of joints. Forms shall not be pieced out by use of material different from those in the adjacent form or in such manner as will detract from the uniformity of the finished surface.
- D. For surfaces other than those to be given rubbed finish forms shall be made of wood, metal, or other acceptable material. Wooden forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots. Plywood shall be in reasonably good, condition. Metal forms shall be of an acceptable type for the work involved.

2.02 FORMWORK ACCESSORIES

- A. Form ties to be encased in concrete shall not be made of through bolts or common wire, but shall be of a well-established type, so made and installed as to embody the following features:
 - 1. After removal of the protruding part of the tie, there shall be no metal nearer than 1-1/2" to the face of the concrete.
 - 2. That part of the tie which is to be removed shall be at least 1/2" in diameter, or if smaller, it shall be provided with a wood, metal, or plastic cone 1" long placed against the inside of the forms. Cones shall be carefully removed from the concrete after the forms have been stripped.
 - 3. Ties which pass through walls of liquid retaining basins and all below grade structures which are to remain dry shall be provided with acceptable water stop, securely fastened to the ties.
- B. Form Release Agent: Colorless material, which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete. Acceptable products include Nox-Crete Form Coating Release Agent, Debond Form Coating by L&M Construction Chemicals Inc., or approved equal.
- C. Fillets for Chamfered Corners: Provide 3/4" chamfers constructed using wood strip. Chamfers are required along all concrete edges except along edges wall and slab penetrations.
- D. Nails, spikes, lag bolts, through bolts, anchorages: Sized as required of strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION**3.01 INSPECTION**

- A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 PREPARATION

- A. Earth or rock forms for vertical surfaces are not permitted. The vertical surface of footings shall be formed unless approved otherwise by Engineer based on soil conditions.

3.03 ERECTION

- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- B. Camber slabs and beams to achieve ACI 301 tolerances.
- C. Forms for walls, columns, or piers shall have removable panels at bottom for cleaning, and inspection. Forms for thin sections (such as walls or columns) of considerable height shall be arranged with suitable openings so that the concrete can be placed in a manner that will prevent segregation and accumulations of hardened concrete on the forms or reinforcement above the fresh concrete, unless special spouts are used to place concrete, and so that construction joints can be properly keyed and treated.
- D. Forms for exposed surfaces shall be built with 3/4" chamfer strips attached to produce smooth, straight chamfers at all sharp edges of concrete. See 2.02 above.
- E. Before form material is reused, all surfaces that are in contact with the concrete shall be thoroughly cleaned, all damaged places repaired, and all projecting nails withdrawn.

3.04 TOLERANCES

- A. ACI 117 shall be followed for forming tolerance limits.

3.05 APPLICATION OF RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

3.06 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for work embedded in or passing through concrete.
- B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.07 FORM REMOVAL

- A. Do not remove forms and bracing until concrete has sufficient strength to support its own weight, construction and design loads, which may be imposed upon it. Remove load supporting forms when concrete has attained 75 percent of required 28-day compressive strength, provided construction is re-shored immediately, and the shoring remains until the concrete attains its 28-day compressive strength.
- B. Reshore structural members due to design requirements or construction conditions to permit successive construction.
- C. Remove formwork progressively so that unbalanced loads are not imposed on structure.
- D. Do not damage concrete surfaces during form removal.

3.08 CLEANING

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean out ports.
- C. During cold weather, remove ice and snow from forms. Do not use deicing salts. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

-- END OF SECTION --

SECTION 032100
REINFORCEMENT BARS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Reinforcing steel.
- B. Shop Drawings.

1.02 RELATED WORK

- A. SECTION 031100 – CONCRETE FORMWORK.
- B. SECTION 031500 – CONCRETE EXPANSION & CONTRACTION JOINTS.
- C. SECTION 033000 – CAST-IN-PLACE CONCRETE.

1.03 REFERENCES

- A. ASTM A-615 Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.
- B. ASTM A-616 Rail Steel Deformed and Plain Bars for Concrete Reinforcement.
- C. ASTM A-617 Axle Steel Deformed and Plain Bars for Concrete Reinforcement.
- D. ACI 315 Details and Detailing of Concrete Reinforcement.
- E. ACI 315R Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
- F. ASTM A-185 Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ACI 301-96 Standard Specifications for Structural Concrete.
- H. ACI 117-90 Standard Specifications for Tolerances for Concrete Construction and Materials.

1.04 SUBMITTALS

- A. Shop Drawings: The Contractor shall submit a complete set of shop drawings including schedules and bending drawings for all reinforcement used in the work in accordance with ACI 315, and ACI 315R. Review of drawings by the Contractor and the Engineer is required before shipment can be made. Splices shall be indicated on the shop drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A-615. All bar reinforcement shall be deformed.

- B. Smooth dowels shall be plain steel bars conforming to ASTM A-615, Grade 60.
- C. Welded wire fabric shall conform to ASTM 185, welded steel wire fabric for concrete reinforcement.
- D. Reinforcement supports and other accessories in contact with the forms for members, which will be exposed to view in the finished work, shall have approved high-density polyethylene tips so that the metal portion shall be at least one quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast concrete blocks.

2.02 FABRICATION

- A. Reinforcement shall be bent cold. It shall be bent accurately to the dimensions and shapes shown on the plans and to within tolerances specified in the CRSI Manual of Standard Practice (latest edition).
- B. Reinforcement shall be shipped with bars of the same size and shape, fastened securely with wire and with metal identification tags using size and mark.

PART 3 - EXECUTION

3.01 PLACING AND FASTENING

- A. Before being placed in position, reinforcement shall be cleaned of loose mill and rust scale, dirt and other coatings that will interfere with development of proper bond.
- B. Reinforcement shall be accurately placed in positions shown on the drawings and firmly held in place during placement and hardening of concrete by using annealed wire ties. Bars shall be tied as required to prevent displacement under foot traffic and during casting operations, and shall be placed within tolerances allowed in ACI 117. Unless otherwise indicated, all reinforcement shall be placed to provide the minimum concrete cover specified by ACI.
- C. Distance from the forms shall be maintained by means of stays, blocks, ties, hangers, or other approved supports. (See paragraph 2.01 D) If fabric reinforcement is shipped in rolls, it shall be straightened into flat sheets before being placed.
- D. Before any concrete is placed, the Engineer or his designee shall have inspected the placing of the steel reinforcement and given permission to deposit the concrete. Concrete placed in violation of this provision will be rejected and thereupon shall be removed.
- E. Unless otherwise specified, reinforcement shall be furnished in the full lengths indicated on the plans. Splicing of bars, except where shown on the plans, will not be permitted without the approval of the Engineer. Where splices are made, they shall be staggered insofar as possible. Splices shall be Class B according to the ACI 318. Mat dowels and hook bars shall extend into concrete in compliance with ACI 318 regarding development length.
- F. Wire mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2", staggered to avoid continuous lap in either direction and securely wired or clipped.
- G. Dowels within pads and slabs on grade shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of

dowels shall be oiled or greased or dowels shall be coated with high-density polyethylene with a minimum thickness of 14 mils. At expansion joints, provide dowel caps with a minimum expansion capacity of $\frac{3}{4}$ "

-- END OF SECTION --

SECTION 033000**CAST-IN-PLACE CONCRETE****PART 1 - GENERAL****1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.
- B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest), Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.
- C. All water holding structures shall be tested for leakage by the Contractor. The Contractor shall provide at his own expense all labor, material, temporary bulkheads, pumps, water measuring devices, etc.; necessary to perform the required tests. Each unit shall be tested separately and the leakage tests shall be made prior to backfilling and before equipment is installed. Testing water shall be from any potable, non-potable, or natural moving source such as a river or stream, but not from any still water source such as a lake or pond, and not from any wastewater source.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and DIVISION 01 Specification Sections, apply to this Section.
- B. DIVISION 03 – CONCRETE
- C. DIVISION 31– EARTHWORK

1.03 ACTION SUBMITTALS

The Contractor shall submit the following data for Engineer's review in accordance with DIVISION 01.

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternative design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at the Project site.
 - 2. Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix must be suitable for the job conditions. This shall include at least 3 tests each for 7-day and 28-day compressive strengths for test cylinders made and cured in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M. Include mill test and all other tests for cement, fly ash, aggregates, and admixtures in the laboratory test reports. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a

graph of percentage retained versus sieve size. Submit test reports along with the concrete mix design. Obtain approval before concrete placement.

3. Use a qualified independent testing agency for testing for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- C. Slab, Wall, and Construction Joint Layout Drawings: The Contractor shall submit for review drawings separate from the steel reinforcing drawings, showing the location of all proposed construction joints and the sequence of concrete placements. Layout plans specifically detailing methods and sequences of concrete placements for concrete slabs and walls. Include proposed concrete screed equipment, location of waterstops, and/or any proposed deviations from joints indicated on the contract drawings. Indicate all proposed construction joints required to construct the structure. Location of construction joints is subject to approval of the Engineer.
- D. Form Ties: Submit product data and dimensions and details of form ties for approval.
- E. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Shop drawings shall conform to the latest edition ACI detail manual SP-66. Shop drawings shall be prepared under the direct supervision of a professional engineer licensed in the state in which the project is located and shall include plans, elevations, sections, details, and attachments to other work.
- F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements.
1. Cementitious materials.
 2. Aggregates: Test results showing compliance with required standards, i.e. sieve analysis, aggregate soundness tests, petrographic analysis per ASTM C295/C295M, alkali-aggregate reactivity per ASTM C1260, mortar bar expansion testing per ASTM C1567, etc. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity. Submit Certification of Compliance for freeze-thaw resistant concrete aggregate.
 3. Admixtures: Include the chloride ion content of each admixture and certification from the admixture manufacturer that all admixtures utilized in the design mix are compatible with one another and properly proportioned prior to mix design review by the Engineer.
 - a. Fly Ash: Submit test results in accordance with ASTM C618 for fly ash. Submit test results performed within 6 months of submittal date. Submit manufacturer's policy statement on fly ash use in concrete.
 4. Curing Compounds.
 5. Trial Batches: For each of the preliminary concrete mix designs and shall include slump per ASTM C143, air content per ASTM C231, unit weight per ASTM C138 and compressive strength tests.
 6. Steel Reinforcement: Submit material test results.

7. Field Test of Fresh Concrete: Obtain at least one composite sample for each 50 cubic yd, or fraction thereof, of each concrete mixture placed in any one day. Test fresh concrete in accordance with ACI 301 for compressive strength, slump, and air content.
 8. Submit copies of Delivery Tickets of concrete with field test reports. All field test reports and tickets shall be referenced in writing to the location that the subject concrete was placed.
- G. Leakage Test Reports: All water holding structures shall be tested separately for leakage by Contractor.
- H. Field Quality-Control Reports. Contractor shall submit a signed, dated checklist for each concrete placement that indicates that the forms, reinforcement, and embedded items were independently checked by his quality control person for proper installation prior to placing concrete.
- I. Manufacturer Certification: Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities".
- J. Testing Reports: For all required tests.

1.04 QUALITY ASSURANCE

- A. Qualification Data: Comply with the following including all sub-references contained herein unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete".
 2. ACI 318, "Building Code Requirements for Structural Concrete".
 3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
 4. CRSI 10MSP, "Manual of Standard Practice"
 5. ASTM E329, "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction".
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products that complies with ASTM C94/C94M requirements for production facilities and equipment and is certified according to NRMCA CPMB 100.
- C. Welding Procedure Qualifications: Must be in accordance with AWS D1.4/D1.4M.
- D. Welder Qualifications: Provide certificates in accordance with AWS D1.4/D1.4M or under an equivalent qualification test approved in advance. Welders are permitted to do only the type of welding for which each is specifically qualified.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from a single source, and obtain admixtures from single source from single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING/PROJECT CONDITIONS

- A. Reinforcing Steel:

1. All reinforcing shall be neatly bundled and tagged for placement when delivered to the job site. Bundles shall be properly identified for coordination with mill test reports.
 2. Reinforcing steel shall be stored above ground on platforms or other supports and shall be protected from the weather at all times by suitable covering. It shall be stored in an orderly manner and plainly marked to facilitate identification.
 3. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.
 4. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed. Where there is a delay in depositing concrete, reinforcing shall be re-inspected and, if necessary, recleaned.
- B. Joint Sealers:
1. Do not proceed with installation of joint sealers when ambient and substrate temperature conditions are outside the limits permitted by the joint sealer manufacturer. Do not install joint sealers when joint substrates are wet due to rain, frost, condensation or other causes.
 2. Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

PART 2 - PRODUCTS

2.01 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed, ASTM A706 Grade 60 where required to be welded.
- B. All bar reinforcing shall be from domestic mills and shall have the manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type, and grade.
- C. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

2.02 ANCHOR RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
 1. Configuration: Straight, threaded each end with three sets nut and washer each as indicated.
 2. Nuts: ASTM A563 heavy-hex carbon steel.

3. Washers: ASTM F436, Type 1, hardened carbon steel plus A 36 plate washers where indicated.
4. Finish: As indicated.

2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice", of greater compressive strength than concrete and as follows:
 1. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall be plastic. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks or plastic. Particular attention is directed to the requirement of Paragraph 3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.
 2. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork.
- B. Concrete blocks (dobies), used to support and position bottom reinforcing steel shall have the same or higher compressive strength as specified for the concrete in which it is located.
- C. Mechanical couplers shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcing bars being spliced at each splice. The reinforcing steel and coupler used shall be compatible for obtaining the required strength of the connection.

2.04 FORMWORK

- A. Formwork shall conform to ACI SP-4.
- B. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.
- C. All forms shall be smooth surface forms unless otherwise specified.
- D. Forms and falsework shall be designed for total dead load, plus all construction live loads as outlined in ACI 347. Design and engineering of formwork and safety considerations during construction shall be the responsibility of the Contractor.
- E. Forms shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/600 of the span between structural members.
- F. Form-Release Agents: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- G. Formulate form-release agent with rust inhibitor for steel form-facing materials.

- H. Form Ties: Shall be one of the following:
 - 1. Taper ties that can be removed from the concrete wall after the forms have been stripped, and that have an elastomeric plug seal to place in the hole after the tie is removed.
 - 2. Snap ties that remain in the wall and the ends can be snapped off at least 1½ inches below the surface of the concrete. Snap ties shall have integral water stops.
 - 3. She-bolts with ends at least 1½ inches below the surface of the concrete.
 - 4. Coil ties with ends at least 1½ inches below the surface of the concrete.
- I. Form Ties for water-retaining structures shall have integral waterstops.
- J. Flat or strap ties are not permitted.

2.05 HYDRAULIC CEMENT

- A. Portland Cement: ASTM C150, Type I/II. Type III may only be used with Engineer's written approval.
- B. When potentially reactive aggregates are to be used in the concrete mix, cement shall meet the following requirements:
 - 1. For concrete mixed with only Portland Cement, the total alkalis in the cement (calculated as the percentage of Na_2O plus 0.658 times the percentage of K_2O) shall not exceed 0.40%.
 - 2. For concrete mixed with Portland Cement and an appropriate amount of fly ash the total alkalis in the Portland Cement (calculated as the percentage of Na_2O plus 0.658 times the percentage of K_2O) shall not exceed 0.85%.
 - 3. When non-reactive are used in the concrete mix, total alkalis in the cement shall not exceed 1.0%.
 - 4. The proposed Portland Cement shall not contain more than 8% tricalcium aluminate and more than 12% tetra-calcium aluminoferrite.
- C. Different types of cement shall not be mixed nor shall they be used alternately except when authorized in writing by the Engineer. Different brands of cement or the same brand from different mills may be used alternately. A resubmittal will be required if different cements are proposed during the Project.
- D. Cement shall be stored in a suitable weather-tight building so as to prevent deterioration or contamination. Cement which has become caked, partially hydrated, or otherwise damaged will be rejected.

2.06 FLY ASH

- A. Fly Ash: ASTM C618, Class F with a maximum LOI of 6%, a maximum free carbon content of 3.0% and a maximum available alkali content (as Na_2O) of 1.5%.

- B. Where reactive aggregates are used in concrete mix, the fly ash constituent shall be between 15% and 25% of the total weight of the combined Portland Cement and fly ash.
- C. For concrete to be used in environmental concrete structures, i.e. process structures or fluid containing structures, the inclusion of fly ash in the concrete mix is mandatory.

2.07 WATER

- A. Water: ASTM C94/C94M
- B. Water used for mixing concrete shall be clear, potable, and free from deleterious substances such as objectionable quantities of silty organic matter, alkali, salts, and other impurities.

2.08 AGGREGATES

- A. Normal-Weight Aggregates: ASTM C33.
- B. Fine aggregate (sand) in the various concrete mixes shall consist of natural or manufactured sand, clean and free of deleterious substances, and conforming to ASTM C33.
- C. Coarse aggregates shall consist of hard, clean, durable gravel, crushed gravel or crushed rock. Coarse aggregate shall be size #57 or #67 conforming to ASTM C33.
 - 1. Supplier shall certify that coarse aggregate source has a demonstrated history of not causing alkali silica reaction in concrete.
- D. Provide aggregates from a single source.
- E. Aggregates shall be tested for gradation by sieve analysis tests in conformance with ASTM C136.
- F. Aggregates shall be tested for soundness in accordance with ASTM C88. The loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using magnesium sulfate.
- G. Non-reactive aggregates shall meet the following requirements:
 - 1. Fine and coarse aggregates shall be tested and evaluated for alkali-aggregate reactivity in accordance with ASTM C1260. The fine and coarse aggregates shall be evaluated separately and in combination, which matches the Contractor's proposed mix design proportioning. All results for the separate and combination testing shall have a measured expansion less than 0.008 percent at 16 days after casting. Should the test data indicate an expansion of 0.08 percent or greater, the aggregate shall be rejected or additional testing using ASTM C1260 and ASTM C1567 shall be performed. The additional testing using ASTM C1260 and ASTM C1567 shall be performed using the low alkali Portland cement in combination with Class F fly ash. Class F fly ash shall be used in the range of 25 to 40 percent of the total cementitious material by mass.
 - 2. A petrographic analysis in accordance with ASTM C295 shall be performed to identify the constituents for the fine and coarse aggregate. Non-reactive aggregates shall meet the following limitations:

- a. Optically strained, microfractured, or microcrystalline quartz, 5.0% maximum.
 - b. Chert or chalcedony, 3.0% maximum.
 - c. Tridymite or cristobalite, 1.0% maximum.
 - d. Opal, 0.5% maximum.
 - e. Natural volcanic glass in volcanic rocks, 3.0% maximum.
3. Proposed concrete mix including proposed aggregates shall be evaluated by ASTM C1567. Mean mortar bar expansions at 16 days shall be less than 0.08%. Tests shall be made using exact proportion of all materials proposed for use on the job in design mix submitted.
- H. All aggregates shall be considered reactive unless they meet the requirements above for non-reactive aggregates. Aggregates with a lithology essentially similar to sources in the same region found to be reactive in service shall be considered reactive regardless of the results of the tests above.
- I. Contractor shall submit form certifying that all aggregates used for this Project meet the Tennessee Department of Highways' requirements for freeze-thaw resistance.
- J. Contractor shall submit a new trial mix to the Engineer for approval whenever a different aggregate or gradation is proposed.

2.09 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260.
- B. Air entraining agent shall be added to all concrete unless noted otherwise. Air content of concrete, when placed, shall be within the ranges given in the concrete mix design.
- C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- D. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.

- E. Admixtures containing calcium chloride, thiocyanate or more than 0.05 percent chloride ions are not permitted.
- F. The addition of admixtures to prevent freezing is not permitted.
- G. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:
 - 1. The admixture shall conform to ASTM C494, except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C 494.
 - 2. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion, require the use of a set retarding admixture for mass concrete 2.5 feet or more thick for all concrete whenever the temperature at the time concrete is cast exceeds 80oF. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.

2.10 CLASSES OF CONCRETE AND USAGE

- A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths:
 - 1. Selection of Proportions for Class A Concrete:
 - a. 4,500 psi compressive for strength at 28 days.
 - b. Type I/II cement plus supplementary cementitious materials.
 - c. Max. water-cementitious materials ratio = 0.45.
 - d. Min. cement content = 564 lbs.
 - e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max.). Walls with architectural treatment shall use #67 stone.
 - f. Air content = 6% plus or minus 1% by volume for exterior concrete, except interior smooth finished slabs shall have 2% plus or minus 1% by volume.
 - g. Fly Ash = 25% maximum.
 - h. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.
 - 2. Selection of Proportions for Class B Concrete:
 - a. 3,500 psi compressive strength at 28 days.

- b. Type I/II cement plus supplementary cementitious materials.
 - c. Max. water-cementitious materials ratio = 0.50.
 - d. Min. cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.
 - e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max). Walls with architectural treatment shall use No. 67 (3/4" max.).
 - f. Air content = 6% plus or minus 1% by volume if exposed to freezing and thawing.
 - g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.
- B. Concrete shall be used as follows:
- 1. Class A concrete for all concrete work except as noted below.
 - 2. Class B non-structural concrete for fill concrete, thrust blocks, and where indicated on the Drawings.

2.11 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type I, Class B, dissipating.

2.12 RELATED MATERIALS

- A. Bonding Agents: ASTM C1059-C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
- C. Expansion Joint Filler: Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material and size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Provide either flexible, open cell polyurethane foam or non-gassing, closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer.
- D. Joint Sealants: ASTM C920, Type M, Class 25, Use T, M, A, I. Use non-sag type on vertical surfaces.

- E. Polyvinyl Chloride (PVC) Waterstops:
1. PVC waterstops for construction joints shall have width and shape as indicated on the drawings with a minimum thickness at any point of 3/8 inches.
 2. Waterstops for expansion joints shall have width and shape as indicated on the drawings with a minimum thickness at any point of 3/8 inches.
 3. The required minimum physical characteristics for this material are:
 - a. Tensile Strength = 1750 psi (ASTM D638)
 - b. Ultimate Elongation = not less than 280% (ASTM D638)
 4. No reclaimed PVC shall be used for the manufacturing of the waterstops. The Contractor shall furnish certification that the proposed waterstops meet the above requirements.
 5. Waterstops shall be securely wired into place to maintain proper position during placement of fresh concrete, as shown on the Drawings. Care shall be taken in the installation of the waterstop and the placing of the concrete to avoid "folding" while concrete is being placed, and to prevent voids in the concrete surrounding the waterstop.
- F. Chamfer strips shall be one (1) inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.

PART 3 - EXECUTION

3.01 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Reinforcement bars shall not be straightened or re-bent in a manner that will injure the material. Heating of bars is not permitted.
- E. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

3.02 FORMWORK

- A. No falsework or forms shall be used which are not clean and suitable. Deformed, broken or defective falsework and forms shall be removed from the work.

- B. Forms shall be smooth and free from surface irregularities. Joints between the forms shall be sealed to eliminate any irregularities. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to a practical minimum.
- C. Forms shall be true to line and grade, and shall be sufficiently rigid to prevent displacement and sagging between supports. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly-placed concrete.
- D. Forms shall be mortar tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete.
- E. All forms shall be constructed in such a manner that they can be removed without hammering or prying against the concrete. Forms shall not be disturbed until the concrete has attained sufficient strength. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
- F. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet prior to placing concrete.

3.03 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Construction joints shall be positioned so as not to adversely affect the structural performance.
 - 5. All joints in water bearing structures shall have a waterstop. All joints below grade in walls or slabs which enclose an accessible area shall have a waterstop.
- C. Expansion Joints: All expansion joints in water-bearing structures shall have a center-bulb type waterstop. All expansion joints below grade in walls or slabs which enclose an accessible area shall have a center-bulb type waterstop.
- D. Contraction Joints in Slabs: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- E. Isolation Joints in Slabs: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated:
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- F. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.04 CONCRETE MIXING

- A. All concrete shall be machine mixed. Hand mixing of concrete will not be permitted. The Contractor may supply concrete from a ready-mix plant or from a site mixed plant. In selecting the source for concrete production, the Contractor shall carefully consider its capability for providing quality concrete at a rate commensurate with the requirements of the placements so that well bonded, homogenous concrete, free of cold joints, is assured.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 2. Any truck delivering concrete to the job site, which is not accompanied by a delivery ticket showing the following information will be rejected and such truck shall immediately depart from the job site:
 - a. Date and truck number
 - b. Ticket number
 - c. Mix designation of concrete
 - d. Cubic yards of concrete
 - e. Cement brand, type, and weight in pounds
 - f. Weight in pounds of fine aggregate
 - g. Weight in pounds of coarse aggregate
 - h. Air entraining agent, brand, and weight in pounds and ounces
 - i. Admixtures, brand and weight in pounds and ounces

- j. Water, in gallons, stored in attached tank
 - k. Water, in gallons, maximum that can be added without exceeding design water/cement ratio
 - l. Time of loading
 - m. Time of delivery to job (by truck driver)
- C. Project Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer.
1. Scales for weighing concrete ingredients shall be accurate when in use within +/- 0.04 percent of their total capacities. Standard test weights shall be available to permit checking scale accuracy.
 2. The concrete shall be mixed in a batch mixer capable of thoroughly combining the aggregates, cement, and water into a uniform mass within the specified mixing time, and of discharging the concrete without harmful segregation. The mixer shall bear a manufacturer's rating plate indicating the rated capacity and the recommended revolutions per minute and shall be operated in accordance with.
 3. The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixing blades shall be replaced when they have lost 10% of their original height.
 4. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 5. For mixer capacity larger than 1 cu. Yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd.
 6. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.
 7. Concrete shall be mixed only in quantities for immediate use and within the time and mixing requirements of ASTM C94.

3.05 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation:
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.
- G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- I. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Horizontal joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

3.06 FINISHES

- A. Exposed to Public View Concrete Surfaces:

1. For all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks, form faces shall be smooth and forms shall be true-to-line and grade. Surfaces produced by forms shall require only minor dressing to arrive at true surfaces. Do not reuse forms with surface wear, tears, or defects that lessen the quality of the surface. Thoroughly clean and properly coat forms before reuse.
 2. All formed exposed to view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one (1) foot below the minimum liquid level that will occur during normal operations.
- B. All vertical surfaces in liquid containing structures shall have a "smooth form" finish.
1. All "smooth form" concrete vertical surfaces shall be a true plane within 1/4 inch in ten (10) feet as determined by a ten (10) foot straightedge placed anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8 inch.
- C. Basin, flume, conduit and tank floors shall have a "smooth troweled" finish unless shown otherwise on Drawings.
- D. Weirs and overflow surfaces shall be given a hard "smooth troweled" finish.
- E. Exterior platforms, steps and landings, shall be given a "broom" finish. "Broom" finish shall be applied to surfaces which have been steel-troweled to an even, smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.

3.07 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Foundations: Provide foundations as shown on Drawings.
1. Unless otherwise directed by the Engineer, the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.
- D. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 02300 "Earthwork". Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

- E. Concrete Walks and Curbs:
1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.
 2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns, driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a "broomed" finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 6 x 6-W1.4xW1.4 welded wire reinforcement.
 3. Concrete curbs shall be constructed to the section indicated on the Standard Detail, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the Engineer. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4-inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.
- F. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with non-shrink grout. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions. After the grout has set, exposed surfaces shall be cut back one (1) inch and covered with a parge coat of mortar consisting of one (1) part Portland cement, two (2) parts sand and sufficient water to make the mixture placeable. Parge coat shall have a smooth dense finish. Exposed surfaces of grout and parge coat shall be water cured with wet burlap for seven (7) days.
- G. Grout fill which is formed in place by using rotating equipment as a screen, such as clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.
- H. Unless otherwise shown or directed, all pumps, other equipment, and items such as lockers, motor control centers and the like, shall be installed on concrete bases. The

bases shall be constructed to the dimensions shown on the plans or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the metal equipment base. In general, the concrete bases shall be placed up to 2 inches below the metal base. The equipment shall then be properly shimmed to grade and the 2- inch void filled with non-shrink grout.

- I. Manhole or access steps shall be plastic, constructed of copolymer polypropylene meeting the requirements of ASTM D2146 for Type II, Grade 16906 material. Step shall be reinforced with ASTM A615, Grade 60, #4 deformed steel reinforcing bar, be 9" deep, 14" wide, provided with notched tread ridge, foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. industries, Inc., Peachtree City, Georgia. Steps shall be installed by drilling 1" diameter holes, minimum 3-3/4 inches deep into the wall and then driving steps into hole to the penetration stop, resulting in a press fit condition.
- J. All existing contact surfaces with new patch shall be coated with moisture insensitive epoxy bonding adhesive, Sikadur Hi-Mod, Concrevic LPL Liquid by BASF Construction Chemicals, or approved equal. Patch shall consist of base pour of 4,000 psi structural concrete, then a topping of non-shrink natural aggregate grout, Masterflow 713, SonogROUT by BASF Construction Chemicals, or approved equal, mixed and placed in accordance with manufacturer's instructions, to the thicknesses shown on Drawings. Coat base pour with epoxy bonding adhesive prior to placing grout course.

3.08 WATERTIGHTNESS TESTING

- A. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that, when completed and tested, there shall be no loss of water and no wet spots shall show.
- B. The structure shall not be tested before all elements of the structure which resist any portion of the retained liquid pressure are in place and the concrete has attained its specified compressive strength.
- C. Unless otherwise specified, coating shall not be applied until after the hydrostatic tightness testing is complete. Liners that are mechanically locked to the surface during the placement of the concrete shall be installed before the hydrostatic tightness testing. Interior liners shall be visually examined for deficiencies and must pass integrity testing. Deficiencies shall be repaired.
- D. The concrete surfaces and concrete joints shall be thoroughly inspected for potential leakage points. Areas of potential leakage shall be repaired before filling the containment structure with water.
- E. All openings, fittings, and pipe penetrations in the structure shell shall be inspected at both faces of the concrete, if practical. Defective or cracked concrete shall be repaired prior to testing. All structural penetrations and inlets/outlets shall be securely sealed to prevent the loss of water from the structure during the test. All structural penetrations shall be monitored before and during the test to determine the watertightness of these appurtenances. If the structure is to be filled using the inlet/outlet pipe, positive means shall be provided to check that water is not entering or leaving through this pipe once the structure is filled to the test level. Leakage at these inlet/outlets shall be repaired prior to testing. No allowance shall be made in the test measurements for uncorrected known points of leakage.
- F. No backfill shall be placed against the walls or on the wall footings of the structure to be tested unless otherwise specified.

- G. The groundwater level shall be brought to a level below the top of the base slab and kept at that elevation or at a lower elevation during the test.
- H. As soon as practicable, after the completion of the structures, the Contractor shall fill them with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.
- I. The allowable loss of water for tightness tests shall not exceed 0.050% of the test water volume in 24 hours.
- J. After repairs, if any are required, the structures shall be tested again and further repaired if necessary, until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
- K. If any leaks, in excess of the specified amount, are not remedied by the Contractor within four weeks of notification by the Engineer, regardless of whether the cause of these leaks is or is not determined, the Engineer shall have the authority to have these leaks repaired by others. The cost of repairs, by others, shall be deducted from monies due or to become due to the General Contractor.
- L. Waterstops shall be placed in other locations as indicated on the Drawings and as required to assure the watertightness of all containers of liquids. Special shop fabricated ells, tees and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, water stops shall be turned up to be made continuous with waterstops at bottom of walls or in walls.
- M. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe; the groove shall be filled with a quick setting hydraulic compound similar and equal to Waterplug as made by BASF Construction Chemicals mixed and applied in accordance with the manufacturer's instructions.

3.09 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.10 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.03 inch-wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and

mixture as original concrete except without coarse aggregate. Place, compact, and finish blending with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of damaged or defective concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
 - F. Repair materials and installation not specified above may be used subject to Engineer's approval.

END OF SECTION

DIVISION 05

METALS

SECTION 051200
STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes structural steel, as shown on the Contract Drawings, complete including framing members, base and anchor plates, connections, grouting under base and anchor plates, fabrication, delivery and installation.

1.02 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements are specified herein:
1. American Society for Testing and Materials (ASTM)
 - a. ASTM A36 - Angles, plates and threaded rods.
 - b. ASTM A992, Grade 50 - Structural Steel.
 - c. ASTM A53 - Pipe, steel, black and hot-dipped, zinc-coated welded and seamless.
 - d. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
 - e. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.
 - f. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
 - g. ASTM A325 - High Strength Bolts for Structural Steel Joints.
 - h. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
 - i. ASTM F1554 - Anchor Bolts
 2. American Welding Society
 - a. AWS A2.0 - Standard Welding Symbols.
 - b. AWS D1.1 - Structural Welding Code.
 3. American Institute of Steel Construction
 - a. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
 4. SSPC - Steel Structures Painting Council.

1.03 QUALITY ASSURANCE

- A. Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

- C. Comply with applicable provisions of the following specifications and documents:
 1. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 2. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, and Bars for Structural Use."
 3. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Comply with applicable provisions of AWS D1.1 "Structural Welding Code – Steel."

1.04 PERFORMANCE REQUIREMENTS

- A. Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand the design load for the size and length of the members indicated on the Contract Drawings.
- B. Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

1.05 SUBMITTALS

- A. In addition to those submittals identified in the General Provisions, the following items shall also be submitted:
- B. Product data for each type of product indicated.
- C. Shop drawings showing fabrication of structural-steel components.
 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical, high-strength bolted connections.
- D. Manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.
- E. Mill test reports signed by manufacturers certifying that the following products comply with requirements:
 1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 3. Shop primers.
 4. Non-shrink grout.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on Contract Drawings.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver structural steel to project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.08 SEQUENCING

- A. Supply anchorage items to be embedded in, or attached to, other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Not applicable

2.02 MATERIALS AND CONSTRUCTION

- A. Structural steel members, except for angles, plates, anchor bolts and threaded rods shall comply with ASTM A992, Grade 50, high strength steel.
- B. Steel angles, plates and threaded rods shall comply with ASTM A36, carbon steel.
- C. Anchor bolts shall comply with ASTM F1554, Grade 36 minimum.
- D. Pipe shall comply with ASTM A53, Grade B.
- E. Bolts, nuts, and washers shall meet ASTM A325.
- F. Welding materials shall meet AWS D1.1, type required for materials being welded.
- G. Grout shall be a non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water-reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

- H. Primer shall be fast curing, lead and chromate free, universal primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS-TT-P-664. Primer shall be compatible with finish paint system.

2.03 FABRICATION

- A. Fabricate and assemble in shop to greatest extent possible. Fabricate items according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC specifications referenced in this section, and as indicated on final shop drawings.
 - 1. Provide cambered structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
 - 5. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 - 6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Accurately finish ends of columns and other members transmitting bearing loads.
- E. Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning. Drill holes in bearing plates.
 - 2. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- F. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure, free of marking, burns and other defects.

2.04 FINISH

- A. Prepare structural component surfaces in accordance with SSPC specifications. Exposed structural steel shall receive a finish paint system.
- B. Surface preparation, primer and finish coating shall be as specified in specification Section 099000 Painting and Coating.
- C. Hot-dip galvanize structural steel assemblies according to ASTM A 123 where indicated.

2.05 SHOP CONNECTIONS

- A. Shop-install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
- C. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

2.06 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
- B. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Examination
 - 1. Verify that field conditions are acceptable and are ready to receive work.
 - 2. Beginning of installation means erector accepts existing conditions.
- B. Setting Bases and Bearing Plates
 - 1. Remove bond-reducing materials from all concrete and masonry bearing surfaces and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.
 - 2. Set loose and attached base plates and bearing plates for structural members or wedges or other adjusting devices. A minimum of 4 anchor bolts shall be used for column base plates.
 - 3. Weld plate washers to top of base plate.
 - 4. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.

5. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Erection

1. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
2. Erect structural steel accurately in locations and to elevations indicated and according to AISC specs referenced in this section.
3. Field weld components indicated on Contract Drawings. Components shall be free of primer and paint prior to field welding.
4. Do not field cut or alter structural members without prior approval from Owner.
5. After erection, prime welds, abrasions, and surfaces not shop primed except surfaces to be in contact with concrete.
6. Level and plumb individual members of structures within specified AISC tolerances.

3.02 FIELD CONNECTIONS

- A. Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 1. Comply with AISC specifications referenced in this section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.03 FIELD QUALITY CONTROL

- A. Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- B. Field welds will be visually inspected according to AWS D1.1.

- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.04 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Cleaning and touchup painting are specified in specification Section 099000 Painting and Coating.

- END OF SECTION -

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes miscellaneous metal fabrications as shown on the Contract Drawings, complete including fabrication, shop finishing and installation.

1.02 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements are specified herein:
1. American Society for Testing and Materials (ASTM)
 - a. ASTM A36 – Angles, plates and threaded rods.
 - b. ASTM A53 - Pipe, steel, black and hot-dipped, zinc-coated welded and seamless.
 - c. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.
 - d. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - e. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - f. ASTM A193 – Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature Service.
 - g. ASTM A194 – Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service.
 - h. ASTM A269 – Seamless and Welded Austenitic Stainless-Steel Tubing
 - i. ASTM A276 – Stainless Steel Bars and Shapes
 - j. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.
 - k. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
 - l. ASTM A325 - High Strength Bolts for Structural Steel Joints.
 - m. ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.
 - n. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
 - o. ASTM A992, Grade 50 - Structural Steel.
 - p. ASTM B177 - Chromium Electroplating on Steel for Engineering Use.
 - q. ASTM B221 - Aluminum and Aluminum-Alloy Extruded bars, rods, wire, shapes, and tubes.
 - r. ASTM B308 - Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
 - s. ASTM F1554 – Anchor bolts.

2. American Welding Society (AWS)
 - a. AWS A2.0 - Standard Welding Symbols.
 - b. AWS D1.1 - Structural Welding Code.
3. SSPC - Steel Structures Painting Council.

1.03 QUALITY ASSURANCE

- A. Perform work in accordance with the following:
 1. Prepare shop drawings under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Georgia.
 2. Use certified welders employed on the Work, with verification of AWS qualification within the previous 12 months.

1.04 SUBMITTALS

- A. In addition to those submittals identified in the General Provisions, the following items shall also be submitted:
 1. Shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 2. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.05 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

- A. Structural steel sections shall be ASTM A992, Grade 50.
- B. Steel angles, plates and threaded rods shall be ASTM A36.
- C. Steel anchor bolts shall be ASTM F1554, Grade 36 minimum.
- D. Aluminum sections shall be ASTM B308, Alloy 6061-T6.
- E. Steel tubing shall be ASTM A500, Grade B.
- F. Steel pipe shall be ASTM A53, Grade B, Schedule 40. Bollards shall be Schedule 80.
- G. Bolts, nuts, and washers for structural steel connections shall be ASTM A325 galvanized to ASTM A153 for galvanized components.
- H. Stainless steel extrusions shall comply with ASTM A269, Type 304 or 316.

- I. Stainless steel bolts shall be ASTM A193, Type 304 or 316, grade B8 or B8M.
- J. Stainless steel nuts shall be ASTM A194, Type 304 or 316, grade 8 or 8M.
- K. Stainless steel washers shall be ANSI B18.22.1.
- L. Welding materials shall comply with AWS D1.1; type required for materials being welded.
- M. Adhesive anchors for solid base substrates shall be a two-component adhesive system supplied in manufacturer's standard side-by-side or co-axial cartridge dispensed through a static mixing nozzle. System shall be capable of anchoring internally threaded inserts, threaded rods and steel reinforcing. Adhesive anchor system shall be one of the following:
 - 1. For applications above 40°F, use one of the following:
 - a. HIT HY 150 MAX or HIT RE 500 Injection Adhesive system by HILTI, Inc.
 - b. SET High Strength Epoxy system by Simpson Strong-Tie
 - 2. For applications below 40°F, use one of the following:
 - a. HIT-ICE Injection Adhesive system by HILTI, Inc.
 - b. ACRYLIC-TIE system by Simpson Strong-Tie
- N. Adhesive anchors for hollow base substrates shall be a two-component adhesive system supplied in manufacturer's standard side-by-side or co-axial cartridge dispensed through a static mixing nozzle. System shall be capable of anchoring internally threaded inserts, threaded rods and steel reinforcing. Adhesive anchor system shall be one of the following:
 - 1. For applications above 40°F, use one of the following:
 - a. HIT HY 20 Injection Adhesive system with screen tube by HILTI, Inc.
 - b. SET High Strength Epoxy system with screen tube by Simpson Strong-Tie
 - 2. For applications below 40°F, consult manufacturer for recommendation.
- O. Expansion bolts shall be HSL Expansion anchors by HILTI, Inc. or WEDGE-ALL wedge anchors by Simpson Strong-Tie.
- P. Primer for steel shall be fast-curing, lead and chromate free, universal primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS-TT-P-664. Primer shall be compatible with finish paint system.

2.02 FABRICATION

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed mechanical fastenings shall consist of flush countersunk screws or bolts, unobtrusively located, consistent with design of component, except where specifically noted otherwise.

- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FINISHES

- A. Surface preparation, primer and finish coating shall be as specified in specification Section 099000 Painting and Coating.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- B. Items to be galvanized shall be given a minimum 2.0 oz/sq ft zinc coating in accordance with ASTM A386.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Examination
 - 1. Verify that field conditions are acceptable and are ready to receive work.
 - 2. Beginning of installation means erector accepts existing conditions.
- B. Preparation
 - 1. Clean and strip primed steel items to bare metal where site welding is required.
 - 2. Supply items required to be cast into concrete or embedded in masonry with setting templates.
- C. Erection
 - 1. Install items plumb and level, accurately fitted, free from distortion or defects.
 - 2. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
 - 3. Field weld components indicated on shop drawings.
 - 4. Perform field welding in accordance with AWS D1.1.
- D. Erection Tolerances
 - 1. Maximum variation from plumb shall be 1/4 inch per 10 feet, non-cumulative.
 - 2. Maximum offset from true alignment shall be 1/4 inch.
- E. Schedule
 - 1. Bollards shall be steel pipe, concrete filled, crowned cap, size as detailed; galvanized.

2. Miscellaneous framing angles, channels and plates not attached to structural framing shall be steel, prime painted. However, if exterior installation, galvanized, and prime painted.
4. Overhead door wall openings shall be steel channel sections, galvanized, and prime painted.

- END OF SECTION -

SECTION 055200**ALUMINUM HANDRAILS AND RAILINGS****PART 1 - GENERAL****1.01 SCOPE OF WORK**

- A. Extent and dimensions of handrails and railings are indicated on Drawings and include miscellaneous handrails and railing systems not included in other Sections of these Specifications.
- B. Type of handrails and railing systems in this Section is aluminum pipe handrails and railing systems.
- C. Products furnished but not installed under this Section include inserts and anchors preset in masonry and concrete for anchorage of hand rails and railing systems.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's technical data for products and processes used in handrails and railing systems, including finishes and grout.
- B. Shop Drawings: Shop details of fabrication and installation for each type and material of handrail and railing system required including plans, elevations, sections, profiles of rails, fittings, connections, and anchors.
- C. Samples: Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work. Where finish involves normal color and texture variations, include sample sets composed of two (2) or more units showing limits of such variations expected in completed work. Include 6" long samples of each distinctly different railing member including handrails, top rails, posts, and samples of fittings and brackets.

1.03 SYSTEM DESCRIPTION

- A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
 - 1. Top Rail of Guardrail Systems: Concentrated load of 200 lbf applied at any point and in any direction and a uniform load of 50 lbf per linear foot applied horizontally and concurrently with a uniform load of 100 lbf per linear foot applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
 - 2. Infill Area of Guardrail Systems: Horizontal concentrated load of 200 lbf applied to 1 sq. ft. (0.09 sq. m) at any point in the system including gates, panels, intermediate rails, balusters, or other elements composing the infill area. Loads on infill area need not be assumed to act concurrently with loads on top rails.

- B. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- C. Material for rails and gates shall be a minimum of 1-1/2" diameter Schedule 40 pipe and for posts, a minimum of Schedule 80.

1.04 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.
- B. Design Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of structural computations for handrails and railing systems to determine compliance with structural performance requirements indicated.

1.05 STORAGE

- A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide handrails and railing systems of one of the following, or an approved equal. Handrail System shall be equal to "TUFRAIL" as manufactured by Thompson Fabricating Company.
 - 1. Thompson Fabricating Company, Inc., Birmingham, Alabama.
 - 2. Superior Railing Company
 - 3. Alumaguard

2.02 METALS

- A. General: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing system components.
- B. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
 - 1. Extruded Bar and Shapes: ASTM B 221, 6063-T6.
 - 2. Extruded Pipe and Tube: ASTM B 429, 6063-T6.
 - 3. Plate and Sheet: ASTM B 209, 6061-T6.
 - 4. Die and Hand Forgings: ASTM B 247, 6061-T6.
 - 5. Castings: ASTM B 26, 356-T6.

2.03 MISCELLANEOUS MATERIALS

- A. Non-shrink Nonmetallic Grout: Pre-mixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS Specifications, and as required for color match, strength, and compatibility in fabricated items.
- C. Fasteners: Use fasteners of stainless steel for aluminum components, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
- D. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.
- E. Anchors and Inserts: Provide anchors of type, size, and material required for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use stainless steel anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- F. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.04 FABRICATION

- A. General: Fabricate handrails and railing systems to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to comply with requirements indicated for structural performance. Handrail systems which use fittings which are glued or pop-riveted will not be acceptable.
- B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Nonwelded Connections: Fabricate railing systems and handrails for interconnection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- D. Welded Connections for Aluminum Pipe: Fabricate aluminum pipe handrails and railing systems for interconnection of members by concealed internal welds, which eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- E. Form changes in direction of railing members by bending members, insertion of prefabricated elbow fittings, radius bends, or by mitering.
- F. For handrails and railing systems with nonwelded connections which are exposed to exterior or to moisture from condensation or other sources, provide weep hole's or other means for evacuation of entrapped water in hollow sections of railing members.

- G. Toe Boards: Where required by O.S.H.A. and where indicated on the Drawings, provide toe boards at railing systems around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details shown or, if not shown, use manufacturer's standard detail. Toe boards shall be 4" high.
- H. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, hinges, miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated.
- I. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices which are capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
- J. For railing posts set in concrete provide preset sleeves of steel, not less than 6" long and inside dimensions not less than 2" greater than outside dimensions of post, with steel plate forming bottom closure.
- K. Provide slip-fit metal sockets to receive removable railing posts. Fabricate sockets for a close fit with posts and to limit deflection of post without lateral load, measured at top, not to exceed 1/12 of post height. Design and fabricate socket covers to resist accidental dislodgement.
- L. Gates: Provide gates of equal structural properties of railing system with toe board where indicated. Hinges shall be capable of providing a swing of 180 degrees. Provide positive latching device which shall be operable from both sides of gate.

2.05 METAL FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.
- B. Class I Clear Anodized Finish: AA-M10C22A41 (medium satin directional textured mechanical finish; chemical etch, medium matte; 0.7 mil min. thick clear anodic coating) complying with AAMA 607.1.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.
- B. Field Measurements: Take field measurements prior to fabrication.

3.02 INSTALLATION - GENERAL

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installation of handrails and railing systems. Set work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Do not weld, cut or abrade

surfaces of handrails and railing components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.

- C. Field Welding: Comply with applicable AWS Specification for procedures of manual shielded metal-arc welding, for appearance and quality, of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent rail surfaces.
- D. Corrosion Protection: Coat concealed surfaces of aluminum, which will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint or zinc chromate primer.
- E. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at 4'-0" o.c. maximum but not more than that required by design loadings.

3.03 ANCHORING POSTS

- A. Anchor aluminum handrail posts to concrete with manufacturer's base flange assembly for top and side mount brackets recommended for meeting the design criteria. Base flanges and side mount brackets will not be welded to the post but will be mechanically fastened so as to achieve a rigid construction without annealing the post. All connections to concrete will be made using stainless steel wedge anchors, which are to be sized and furnished by the handrail manufacturer as an integral part of their handrail system. Anchor post on new concrete shall be side mounted except where shown otherwise on the drawings.
- B. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose unless otherwise indicated.
- C. Provide removable railing sections as indicated, using slip-fit metal sockets. Accurately locate sockets to match post spacing.

3.04 RAILING CONNECTIONS

- A. Nonwelded Connections: Use manufacturer's standard mechanical joints for permanently connecting railing components. Components that are glued or pop riveted at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railing systems.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

3.05 ANCHORING RAILING ENDS

- A. Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.
- B. Anchor railing ends to metal surfaces with manufacturer's standard fittings using concealed fasteners, unless otherwise indicated.

- C. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip-joint internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.

3.06 ATTACHMENT OF HANDRAILS TO WALLS

- A. General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.
- B. For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.
- C. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.

3.07 PROTECTION

- A. Protect finishes of railing systems and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

- END OF SECTION -

SECTION 055350
GRATINGS & FLOOR PLATES

PART 1 GENERAL**1.01 SUMMARY**

- A. This Section includes the following:
 - 1. Serrated aluminum rectangular bar gratings.
 - 2. Aluminum rectangular bar stair treads with abrasive nosings.

1.02 QUALITY ASSURANCE

- A. Fabricator shall be experienced in producing gratings similar to that indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.
- B. Comply with applicable provisions of AWS D1.2 "Structural Welding Code—Aluminum."
- C. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.03 SUBMITTALS

- A. In addition to those submittals identified in the General Provisions, the following items shall also be submitted:
 - 1. Product data for formed metal bar grating, manufacturer's clips and anchorage devices for gratings, and paint products.
 - 2. Shop drawings detailing fabrication and erection of gratings. Include plans, sections, and details of connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1.04 PROJECT CONDITIONS

Check actual locations of walls and other construction to which gratings must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. McNichols Co.
 - 2. IKG Borden

3. Ohio Gratings, Inc.
4. Or equal

2.02 ALUMINUM CONSTRUCTION

- A. Extruded bars and shapes shall meet ASTM B221 (ASTM B221M), alloys as follows:
1. 6061-T6 or 6063-T6 for bearing bars of gratings and shapes.
 2. 6061-T1 or 6063-T5 for grating cross bars.

2.03 FASTENERS

Provide fasteners of aluminum or nonmagnetic stainless steel.

2.04 FABRICATION

- A. Form from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
1. Shear and punch metals cleanly and accurately.
 2. Remove sharp or rough areas on exposed traffic surfaces.
 3. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated.
- B. Comply with AWS recommendations and the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
- C. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
- D. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

2.05 ALUMINUM BAR GRATING AND STAIR TREADS

- A. Produce aluminum bar gratings of description indicated per NAAMM marking system that comply with the following:
1. Metal Bar Grating Standard: "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" published in ANSI/NAAMM MBG 531 "Metal Bar Grating Manual."

- B. Fabricate swage-locked rectangular bar aluminum gratings to comply with requirements indicated below:
 - 1. Swage-locked grating with 3/16-inch or 1/4-inch thick bearing bars 1-3/16 inches o.c. and cross bars 4 inches o.c.
 - 2. Bearing bar depth shall be as indicated on the Contract Drawings.
- C. Fabricate aluminum grating treads with integral corrugated nosing and with plate carrier at each end for stringer connections. Secure treads to stringer with bolts.
- D. Traffic surface for aluminum bar gratings shall be serrated; abrasive nosing for stair treads.
- E. Aluminum finish for bar gratings and stair treads shall be mill.
- F. Fabricate removable grating sections with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated, or if not indicated, as recommended by manufacturer, for attachment to supports.
 - 1. Provide not less than four stainless steel saddle clips for each section of aluminum grating.
 - 2. Furnish threaded stainless-steel bolts with nuts and washers for each clip required.
- G. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
 - 1. Edge band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
 - 2. Do not notch bearing bars at supports to maintain elevation.

2.06 GRATING FRAMES AND SUPPORTS

- A. Provide frames and supports, where indicated.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive gratings. Fabricate from shapes, plates, and bars of welded construction. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware, and similar items.
- C. Equip frame with integrally welded anchors for casting into concrete or building into masonry.
 - 1. Unless otherwise indicated, space anchors 18 inches o.c. and provide minimum anchor units in the form of aluminum straps 1-1/4 inches wide by 1/4- inch thick by 8 inches long, with right angle bend at end.

2.07 FINISHES

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish gratings, frames, and supports after assembly.

PART 3 EXECUTION

3.01 PREPARATION

Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.02 INSTALLATION, GENERAL

- A. Provide anchorage devices and fasteners where necessary for securing to in-place construction. Include expansion anchors for concrete and masonry, through-bolts, and other connectors as required.
- B. Perform cutting, drilling, and fitting required for installation. Set accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field welding shall comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.03 INSTALLING RECTANGULAR BAR GRATINGS

- A. Install gratings to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Secure removable units to supporting members with type and size of clips and fasteners indicated, or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown. Units not labeled as removable are deemed to be fixed.
- C. Secure fixed units to supporting members by welding where both materials are the same; otherwise, anchor each section of grating with 2 stainless steel saddle clips each end.

- END OF SECTION -

DIVISION 06

WOOD, PLASTICS & COMPOSITES

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

Definition: Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated. Types of work in this section include rough carpentry for the following where applicable and as detailed or indicated on the Drawings:

- A. Erection and construction of project sign as shown on detail in Section 01580 – Project Identification and Signs.
- B. Wood framing, plates, and fascias.
- C. Wood grounds, nailers, blocking and sleepers.
- D. Installation of finished hardware
- E. Blocking for toilet accessories.

1.02 REFERENCES

- A. Lumber Standards: Comply with PS 20 and with applicable rules of the respective grading and inspecting agencies for species and products indicated.
- B. Plywood Product Standards: Comply with PS 1 (ANSI A199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard for type of panel indicated.

1.03 SUBMITTALS

Wood Treatment Data: Submit treatment manufacturer's instructions for proper use of each type of treated material.

- A. Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.
- B. For water-borne preservatives, include statement that moisture content of treated materials was reduced to a maximum of 15% prior to shipment to project site.

1.04 PRODUCT HANDLING

Delivery and Storage: Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks.

1.05 JOB CONDITIONS

Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 - PRODUCTS

2.01 MATERIALS - LUMBER

A. Provide wood for support or attachment of other work including cant strips, buck, nails, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown. Moisture content should be 19% maximum for lumber items not specified to receive wood preservative treatment.

B. Grade: Construction Grade light framing size lumber of any species or board size lumber as required. Provide construction grade boards (RIS or WCLB) or No. 1 boards (SPIB or WWPA).

2.02 WOOD TREATMENT

A. Preservative Treatment: Where lumber or plywood is indicated as "Trt-Wd" or "Treated", or is specified herein to be treated, comply with applicable requirements of AWPS Standards C2 (lumber) and C9 (plywood) and of AWPB standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.

B. Pressure-treat above-ground items with water-borne preservatives complying with AWPB LP-2. After treatment, kiln-dry to a maximum moisture content of 15%. Treat indicated items and the following:

1. Nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with or embedded in masonry or concrete.

C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.03 LUMBER, GENERAL

A. Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Grade Stamps:

1. Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
2. For exposed lumber apply grade stamps to end or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.

C. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content spec or each use.

D. Provide dressed lumber, S4S, unless otherwise indicated.

E. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.04 BOARDS

A. Exposed Boards:

1. Where boards will be exposed in the finished work, provide the following:
2. Moisture Content: 19 percent maximum, "S-DRY".

B. Where painted finish is indicated, provide No. 1 Boards per SPIB rules, Select Merchantable Boards per WCLIB rules, or No. 2 Common Boards and Better per WWPA rules.

C. Concealed Boards:

1. Where boards will be concealed by other work, provide lumber of 19 percent maximum moisture content (S-DRY) and of following species and grade:
2. Redwood construction common per RIS rules, Southern Pine No. 2 Boards per SPIB rules, or any species graded construction boards per WCLIB or WWPA rules.

2.05 MISCELLANEOUS LUMBER

A. Provide wood for support or attachment of other work including bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

B. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

C. Grade: Standard grade light framing size lumber of any species or board size lumber as required. No. 2 Common or Construction grade boards per WCLIB or WWPA rules or No. 2 boards per SPIB rules.

2.06 CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels, and for products not manufactured under PS 1 provisions, with American Plywood Associates (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

2.07 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

B. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

B. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

D. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish material. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

E. Wood Grounds, Nailers, Blocking and Sleepers:

1. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
3. Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

F. Installation of Plywood: Comply with applicable recommendations contained in Form No. E304, "APA Design/Construction Guide - Residential and Commercial", for types of plywood products and applications indicated.

3.02 WOOD FRAMING

A. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual for House Framing" of National Forest Products Association N.F.A.). Do not splice structural members between supports.

B. Anchor and nail as shown, and to comply with "Recommended Nailing Schedule" of "Manual for House Framing" and "National Design Specifications for Wood Construction" published by N.F.P.A.

- END OF SECTION -

DIVISION 07

THERMAL & MOISTURE PROTECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL**1.1 SUMMARY**

- A. This Section includes the following:
1. Board insulation at exterior foundation walls.
 2. Blanket insulation above ceilings and in exterior gable end walls.
 3. Eave ventilation troughs.
 4. Adhesive for bonding insulation.
 5. Insulation tape.

1.2 DEFINITIONS

- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blankets with the latter formed into batts (flat-cut lengths) or rolls.

1.3 SUBMITTALS

- A. General: Submittals shall be provided in accordance with the requirements of the General Provisions and shall include, but not be limited to, the following:
1. Product data for each type of product specified.

1.4 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
1. Surface Burning Characteristic: ASTM E 84.
 2. Fire Resistance Ratings: ASTM E 119.
 3. Combustion Characteristics: ASTM E 136.
- B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
1. Polyisocyanurate Foam-Plastic Board:
Acceptable Manufactures:
 - 1) Owens Corning.
 - 2) Dow: The Dow Chemical Company.
 - 3) Or approved equal.
 2. Glass-Fiber Blanket Insulation:
Acceptable Manufactures:
 - 1) Johns Manville Corporation
 - 2) Owens Corning.
 - 3) Or approved equal.

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Polyisocyanurate Foam-Plastic Board:
 - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft vapor-retarder membrane on 1 face.
- D. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
 - 1. 3-1/2 inches thick with a minimal thermal resistance of R-11.
 - 2. 12 inches thick with a minimal thermal resistance of R-38.

2.3 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation or substrates.
 - 1. Sonneborn Hydrocide 600, 700, 700B.
 - 2. Tamms Dehydratine 75, 85, 95.
 - 3. Or approved equal.
- B. Eave Ventilation Troughs: Preformed rigid fiber-board or plastic sheets designed and sized to fit between roof framing members and provide cross ventilation between insulated attic space and vented soffits.
- C. Insulation Tape: Type recommended by insulation manufacturer to provide continuity of faced insulation's vapor barrier.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, insulation's vapor retarder and adhesive for bonding, including removal of projections that might puncture insulation's vapor retarder or interfere with insulation attachment or that may affect application of adhesive.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids full with insulation. Remove projections that interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. Bond units to substrate to provide permanent placement and support of units.

- B. Seal joints between board insulation units by applying adhesive for bonding to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive for bonding as recommended by insulation manufacturer.
- C. Stuff mineral-fiber insulation into miscellaneous voids and cavity spaces.
- D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 4. Support blankets mechanically, by taping or stapling flanges to flanges of metal studs or bottom chord of truss.
 5. Tape all joints for continuity of vapor barrier.

3.5 INSTALLATION OF PERIMETER FOUNDATION INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.6 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or damp proofing according to manufacturer's written instructions.

3.7 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

3.8 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 4. For wood-framed construction, install blankets according to ASTM C 1320.

3.9 INSTALLATION OF INSULATION IN CEILINGS

- A. Install mineral-fiber insulation over ceilings, between and parallel with trusses, so that insulation extends over entire ceilings.
 1. Set faced units in ceiling with vapor barrier to warm side.
 2. Set faced units in gable end walls with barrier to cold side.

3.10 PROTECTION

- A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or

enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

- - END OF SECTION - -

SECTION 076200**SHEET METAL FLASHING AND TRIM****PART 1 GENERAL****1.1 DESCRIPTION**

This Section includes through wall masonry flashing, valley flashing, drip edges, fascias, miscellaneous sheet metal and accessories.

1.2 QUALITY ASSURANCE

Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.3 SUBMITTALS

- A. Submit shop drawings as specified in the "General Provisions".
- B. Submit manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- C. Submit 8-inch-square samples of specified sheet materials to be exposed as finished surfaces.
- D. Submit shop drawings showing layout, profiles, methods of joining, and anchorages details. Provide layouts at 1/4-inch scale and details at 3-inch scale.
- E. Color: To be selected by Owner.

PART 2 MATERIALS**2.1 DETAILED MATERIAL REQUIREMENTS**

- A. Copper valley flashing shall be ASTM B 370; temper H00 (cold-rolled) except where temper 060 is required for forming; 16 oz. (0.0216-inch thick) except as otherwise indicated.
 - 1. Provide lead coating of 0.06 psf on exposed copper surfaces.
- B. Sheet aluminum fascias shall be ASTM B 209, alloy 3003, temper H14, AA-C22A41 clear anodized finish; 0.032-inch thick (20 gage) except as otherwise indicated.
- C. Extruded aluminum drip edges shall be manufacturer's standard extrusions of sizes and profiles indicated; 0.080-inch minimum thickness for primary legs of extrusions. Custom colors to be selected by Engineer during shop drawing review.
- D. Through wall masonry flashings shall be 3-oz. copper sheet laminated between 2 sheets of bituminous impregnated creped Kraft paper or saturated fabric.
- E. Miscellaneous Materials and Accessories:
 - 1. For use with copper, provide lead-free solder, with rosin flux.
 - 2. Fasteners shall be same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
 - 3. Bituminous coating shall be SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
 - 4. Elastomeric sealant shall be generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

5. Epoxy seam sealer shall be 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
 6. Adhesives shall be the type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
 7. Paper slip sheet shall be 5-lb. rosin-sized building paper.
 8. Polyethylene underlayment shall be minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E 154.
- F. Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- G. Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- H. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- I. Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- J. Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- K. Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate metered and welded corner units.

PART 3 EXECUTION

3.1

INSTALLATION

- A. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Where aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

-- END OF SECTION --

SECTION 077123**GUTTER SYSTEM****PART 1 GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Gutter system shall match the existing color and style as the existing water treatment plant.

1.2 SUMMARY

- A. This Section includes the following manufactured roof specialties:
 - 1. Pre-formed gutters.
 - 2. Break metal formed gutters.
 - 3. Downspouts.
 - 4. Straps, supports and accessories.
 - 5. Leaf screens.
 - 6. Splash blocks.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
 - 3. Division 07 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. MG Listing: Manufacture and install components specified that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1-90. Identify materials with FMG markings.
- C. Manufacture and install components tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: Wind Zone 1. For velocity pressures of 10 to 20 lbf/sqft.: 40-lbf/sqft. perimeter uplift force, 60-lbf/sq. ft. corner uplift force, and 20-lbf/sqft. outward force.
- D. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:
 - 1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.

- 2. Details for expansion and contraction.
- C. Samples for Initial Selection: For each type of manufactured roof specialty indicated with factory-applied color finishes.
- D. Fabrication Samples: For roof edge drainage systems made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of roof edge drainage systems with performance requirements.
- F. Warranty: Special warranty specified in this Section.

1.5 **QUALITY ASSURANCE**

- A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Owner's Representative, except with Owner's Representative's approval. If modifications are proposed, submit comprehensive explanatory data to Owner's Representative for review.

1.6 **COORDINATION**

- A. Coordinate installation of manufactured roof drainage system with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.7 **WARRANTY**

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 **MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 5. Basis-of-Design Product: The designs for roof edge drainage system are based on the products named. Subject to compliance with requirements,

provide either the named products or comparable products by one of the other manufacturers specified.

2.2 EXPOSED AND CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:
1. Surface: Smooth, flat finish.
 2. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Fluoropolymer 3-Coat System: Manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.5 mil, complying with AAMA 2605.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
- C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15 mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 ROOF EDGE DRAINAGE SYSTEMS

- A. Basis-of-Design Product for Preformed Gutters: Metal Era Seal-Tite Industrial Gutter System, customized sizes and shapes as required, or a comparable product by one of the following:
- B. Available Manufacturers:
1. ATAS International, Inc.
 2. Hickman, W. P. Company.
 3. Merchant & Evans, Inc.
 4. MM Systems Corporation.
- C. Gutters and Downspouts: Manufactured and break-formed gutter in uniform section lengths not exceeding 12 feet, with mitered and welded or soldered corner units, end caps, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front gutter rim. Furnish with flat-stock gutter straps and gutter support brackets and expansion joints and expansion-joint covers fabricated from same metal as gutters.
1. Fabricate gutter from the following exposed metal:

- a. Aluminum: 0.050 inch thick.
- 2. Gutter Style: Boxed, according to SMACNA's "Architectural Sheet Metal Manual."
- 3. Applied Splice Plates at Joints: Exposed, formed aluminum, 0.032 inch thick. 6" wide. Finish to match gutter.
- 4. Gutter Accessories: Continuous removable leaf screen.
- 5. Straps and Brackets: 0.125 aluminum, finish to match gutter; 1-inch wide minimum.
- 6. Downspouts: Square closed-face with mitered elbows, manufactured from the following exposed metal. Furnish wall brackets, from same material and finish as downspouts, with anchors.
 - a. Formed Aluminum: 0.063 inch thick.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 - 1. Examine walls and roof edges for suitable conditions for manufactured roof specialties.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.
 - 1. Install manufactured roof specialties with provisions for thermal and structural movement.
 - 2. Torch cutting of manufactured roof specialties is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.
- D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

- E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.
- F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- G. Seal joints with elastomeric or butyl sealant as required by manufacturer of roofing specialties.

3.3 **ROOF EDGE DRAINAGE SYSTEM INSTALLATION**

- A. General: Install gutters and downspouts to produce a complete roof drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Gutters: Join and seal gutter lengths. Attach gutters to firmly anchored gutter brackets or straps spaced not more than 36 inches apart. Slope gutters to downspouts at 1/16 inch per foot slope.
 - 1. Install gutter with expansion joints not exceeding 50 feet apart. Install expansion joint caps.
 - 2. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 48 inches o.c. in between.
 - 1. Provide elbows at base of downspout to direct water away from building.
 - 2. Provide precast concrete, splash blocks at base of downspouts.

3.4 **CLEANING AND PROTECTION**

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

-- END OF SECTION --

SECTION 079100
CAULKING AND SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Shop drawings, including General and Supplementary Conditions and Division 1 Specification sections, apply to work on this section.

1.02 DESCRIPTION OF WORK

- A. All caulking, sealants, etc. as required by the Drawings, and specified herein or necessary to provide weathertight construction. Caulking locations include, but are not limited to, the following:
1. Perimeter of all exterior doors, louvers and window frames.
 2. Expansion joints in new concrete sidewalks.
- B. Extent of each form and type of joint sealer is indicated on drawings.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Refer to Division 8 sections for glazing requirements; not work of this section.
- B. Refer to Division 07 sections for joint sealers in mechanical and electrical work: not work of this section.

1.04 SYSTEM PERFORMANCES

Provide joints sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer who has successfully completed within the last 3 years at least 5 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.
- B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each difference product required.

1.06 GUARANTEE

The Contractor shall guarantee all work under this Section against leakage for a period of three (3) years after final acceptance of work. This guarantee shall also be written against adhesive or cohesive failure, against crazing on surface greater than (3) mils, against staining of adjacent surfaces and against increase or decrease of Shore "A" Durometer hardness greater than 30% of 14-day value of sealant. Any defects occurring during the guarantee period shall be corrected at no additional cost to the Owner.

1.07 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each product required, including instructions for joint preparation and application.
- B. Samples for Initial Selection Purposes: Submit manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to protect site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials, where applicable.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature change, contaminants, or other causes.

1.09 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
 - 2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40°F (4.4°C).
 - 3. When joint substrates are wet due to rain, frost, condensation or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compound for caulking and sealing above grade at windows, doors, etc. shall be a one component urethane sealant suitable for use in both horizontal and vertical joints. Sealant shall be "Sonolastic NP 1" by Sonneborn, Mameco Sealant, Vulkem 116, or an approved equal, for elastomeric coating.
- B. Sealant for concrete and masonry expansion units shall be a one-component, urethane, self-leveling designed for use where indicated.
- C. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- D. Colors: Provide color of exposed joint sealer as selected by Architect from manufacturer's standard colors.
- E. Solvents and cleaners used in preparing surfaces for sealing shall be as recommended by the sealant manufacturer.

- F. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C-920 requirements, including those for Type, Grade, Class and Uses.

2.02 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers: and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: (Where applicable) preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Either flexible, open cell polyurethane foam or non-gassing, closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

2.03 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate and field tests.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.
- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealers and to surfaces adjacent to joint.

PART 3 - EXECUTION

3.01 INSPECTION

Require installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configurations, installation tolerances and other conditions affecting joint sealer performance. Obtain Installer's written report listing any conditions detrimental to performance of joint sealer work. Do not allow joint sealer to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joint immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust: paints, expect for permanent, protective

coatings tested and approved for sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.

2. Clean concrete, masonry, and similar porous joint substrate surfaces, by brushing grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles removing from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrate or leave residues capable of interfacing with adhesion of joint sealers.
- C. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact to sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install Joint-fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint width which allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint-fillers.
 - b. Do not stretch, twist, puncture or tear joint fillers.
 - c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint and as recommended by manufacturer.
 3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for

each joint configuration and providing uniform, cross-sectional shapes and depths relative to joining widths which allow optimum sealant movement capability.

- E. Tooling and Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer. Concave joint configuration per Figure 6A in ASTM C-962, unless otherwise indicated.

3.04 PROTECTION AND CLEANING

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installation with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers joints sealers and of products in which joints occur.

- END OF SECTION -

DIVISION 08

OPENINGS

SECTION 081100
STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Non-fire-rated cold-rolled steel doors and frames.
- B. Cold-rolled steel interior window frames.

1.02 RELATED WORK

- A. Section 087100 - Door Hardware.
- B. Section 08800 – Glass and Glazing.
- C. Section 099000 – Painting and Coating.

1.03 REFERENCES

- A. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
- B. SDI-100 - Standard Steel Doors and Frames.
- C. SDI-105 - Recommended Erection Instructions for Steel Frames.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of SDI-100.

1.05 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Division 1, Section 013323.
- B. Indicate pertinent dimensioning, general construction, component connections and locations, anchorage methods and locations, hardware locations, installation details, handling and special requirements.
- C. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.
- D. Indicate door elevations, internal reinforcement, closure method, cut outs for glazing, and weather-stripping.
- E. Submit manufacturer's installation instructions.

1.06 DELIVERY, STORAGE AND PROTECTION

- A. Protect products per manufacturer's recommendations.
- B. Protect doors and frames with resilient packaging.

- C. Break seal on-site to permit ventilation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Amweld Building Products Division.
- B. Ceco Corp.
- C. Curries Manufacturing, Inc.
- D. Republic Builders Product Corp.
- E. Steelcraft Manufacturing Company.

2.02 DOORS AND FRAMES

- A. Interior Door: SDI-100 Grade II, Model 1; 18 gauge.
- B. Interior Frames: 16 gage thick material, core thickness to suit grade and model of door.
- C. Exterior Doors: SDI-100 Grade II; Model 1; 16 gauge.
- D. Exterior Frame: 16 gage.

2.03 DOOR CORE

- A. Interior Door Core: Impregnated cardboard honeycomb.
- B. Exterior Door Core: Thermal insulation.

2.04 ACCESSORIES

- A. Rubber Silencers: Resilient rubber (3 per jamb). Remove for finished painting and replace.
- B. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style, tamperproof screws.

2.05 FABRICATION

- A. Frames shall be welded units.
- B. Fabricate frames and doors with hardware reinforcement plates welded in place.
- C. Prepare frame silencers. Provide three single rubber silencers for single doors and mullions of double doors on strike side, and two single silencers on frame head at double doors without mullions.
- D. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight.
- E. Exterior frames to receive weather-stripping. Submit shop drawings for review by Architect.

F. At exterior locations, fabricate doors as thermal insulating door and frame assemblies and tested in accordance with ASTM C236. Maximum apparent U factor is 0.24 BTU/Hr/(sq. ft.)/degrees F.

2.06 FINISH

A. Primer: Air dried or baked on.

B. Finish: Enamel or paint suitable as base for specified finish paints. Coordinate with Division 9, Section 099000 "Painting and Coating."

C. Coat inside of frames set in masonry with bituminous coating to a thickness of 1/16 inch. Coating may be shop or field applied, specify accordingly.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install frames in accordance with SDI-105.

B. Install doors in accordance with DHI.

C. Coordinate with masonry construction for anchor placement.

3.02 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

B. Improperly located or anchored frames will be rejected and removed and replaced at this Contractor's expense. Dented, warped, racked or otherwise defective doors or workmanship will be rejected and removed and replaced at this Contractor's expense.

3.03 ADJUSTING AND CLEANING

Adjust hardware for smooth and balanced door movement.

3.04 SCHEDULE

Refer to Drawings for door and frame schedule.

- END OF SECTION -

SECTION 083113
ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Exterior aluminum vault doors and frames in concrete.

1.2 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements are specified herein:
1. Underwriters Laboratories (UL)
Fire Hazard Classifications.
 2. Factory Mutual Engineering Corporation (FM)
Roof Assembly Classifications.
 3. American Society for Testing and Materials (ASTM)
 - a. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate
 - b. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
 4. OSHA - 29 CFR 1910.23

1.3 SUBMITTALS

- A. In addition to the submittals identified in the General Provisions, the following items shall be submitted:
1. For each type of door and frame indicated, include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
 2. Provide shop drawings showing fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachments to other Work.
 3. Provide samples for each door face material, at least 3 by 5 inches in size, in specified finish.
 4. Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

1.4 QUALITY ASSURANCE

- A Obtain doors and frames through one source from a single manufacturer.

- B. Obtain Owner's Representative's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Interior and Exterior Floor/Vault Doors:
 - a. Bilco Company
 - b. Halliday Products Inc.
 - c. Thompson Fabricating LLC
 - d. Or approved equal.

2.2 MATERIALS

- A. Aluminum sheet for cover shall be ¼-inch aluminum diamond plate. Aluminum sheet for frame shall be ¼-inch, extruded aluminum with bend-down anchor tabs around the perimeter. Cover and frame shall meet ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H15; with minimum thickness indicated representing specified thickness according to ANSI H35.2.
- B. Aluminum-alloy rolled tread plate shall meet ASTM B 632/B 632M, alloy 6061-T6.
- C. Steel sheet for cover shall be ¼-inch steel diamond plate. Steel sheet for frame shall be ¼-inch steel plate. Cover and frame shall meet ASTM A36.

2.3 PAINT

- A. Provide primers that comply with Section "Painting and Coating."
- B. Shop primer for ferrous metal shall be a fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Shop primer for metallic-coated steel shall be an organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
- D. Galvanizing repair paint shall be a high-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

2.4 ACCESS DOORS AND FRAMES – CAST-IN-PLACE

- A. Furnish and install where indicated on plans vault access door Type J-AL H20, size width (24") x length (24"). Length denotes hinge side. The floor access door shall be single leaf and pre-assembled from the manufacturer.

- B. Performance characteristics:
 - a. Cover: Shall be reinforced to support AASHTO H-20 wheel load with a maximum deflection of 1/150th of the span. Manufacturer to provide structural calculations stamped by a registered professional engineer upon request.
 - b. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - c. Operation of the cover shall not be affected by temperature.
 - d. Entire door, including all hardware components, shall be highly corrosion resistant.
- C. Cover: Shall be 1/4" (6mm) aluminum diamond pattern.
- D. Frame: Channel frame shall be extruded aluminum with bend down anchor tabs around the perimeter.
- E. Hinges: Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.
- F. Drain Coupling: Provide a 1-1/2" drain coupling located in the corner of the channel frame, location to be determined on the shop drawings.
- G. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate.
- H. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug].
- I. Hardware:
 - a. Hinges: Heavy forged Type 316 stainless steel hinges, each having a minimum 1/4" diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.
 - b. Cover shall be equipped with a hold open arm which automatically locks the cover in the open position.
 - c. Cover shall be fitted with the required number and size of compression spring operators. Springs and spring tubs shall be Type 316 stainless steel.
 - d. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.
 - e. Hardware: Shall be Type 316 stainless steel throughout.
- J. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

2.5 ACCESS DOORS AND FRAMES – MOUNTED

- A. Furnish and install where indicated on plans vault access door SRR-I as manufactured by USD Fabrication, Inc. or ENGINEER APPROVED EQUAL, per size on plans. Length denotes hinge side. The floor access door shall be pre-assembled from the manufacturer.

- B. Performance characteristics:
- a. Cover: Shall be reinforced to support 300 PSF live load.
 - b. The frame shall be 3/16-inch aluminum structural angle with 7/16-inch diameter holes for bolting to curb, slab or roof deck and have an extruded U-shaped EPDM rubber weather seal gasket where the cover closes on the frame.
 - c. The access door shall be equipped with a 316 stainless steel slam lock with fixed exterior and interior handles and interior padlock staple. A 316 stainless steel hold open arm with push/pull handle shall automatically keep the cover in its upright, open position.
 - d. The door shall have a mill finish and hinges fabricated with aluminum lugs and 316 stainless steel pins. The door shall have stainless steel gas shocks to assist in opening the door and reducing the force during closing.
 - e. Installation shall be in accordance with the manufacturer's instructions with others being responsible for providing an effective seal between the frame and the mounting surface.
 - f. Manufacturer shall guarantee the door against defects in materials and workmanship for a period of ten years. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - g. Operation of the cover shall not be affected by temperature.
 - h. Entire door, including all hardware components, shall be highly corrosion resistant.

2.6 FABRICATION

- A. Provide access door assemblies manufactured as integral units ready for installation.
- B. For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. For steel doors and frames, grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. As-fabricated finish shall be AA-M10 (Mechanical Finish: as fabricated, unspecified).
- D. Class I, clear anodic finish shall be AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 EXECUTION**3.1 PREPARATION**

Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.4 FLOOR DOOR SIZES

Refer to Contract Drawings for sizes.

-- END OF SECTION --

SECTION 087100**DOOR HARDWARE****PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Ammonia and Caustic Building Entrance Doors.

1.2 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Other Action Submittals:
 - 1. Door Hardware Sets: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, and material of each door and frame.
 - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - 3) Complete designations of every item required for each door or opening including name and manufacturer.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) Door and frame sizes and materials.
 - c. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
 - 2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
 - 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 2. Installer shall have warehousing facilities in Project's vicinity.

- 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Source Limitation: Obtain each type and variety of door hardware from a single manufacturer.
- 1.4 DELIVERY, STORAGE, AND HANDLING**
- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- 1.5 COORDINATION**
- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- 1.6 MAINTENANCE SERVICE**
- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES

- A. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Hinge Weight: Heavy-weight.
- C. Hinge Base Metal: Stainless steel, with stainless-steel pin.
- D. Hinge Options:
 - 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out swinging exterior doors.
 - 2. Corners: Square.
- E. Fasteners: Comply with the following:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
- F. Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."
- G. Template Hinge Dimensions: BHMA A156.7.
- H. Manufacturers:

1. Hager Companies.
2. McKinney Products Company; an ASSA ABLOY Group company.
3. Stanley Commercial Hardware; Div. of The Stanley Works.
4. Or approved equal.

2.3 LOCKS AND LATCHES

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with ANSI A117.1.
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Lock Trim:
 1. Levers: Wrought, Forged, or Cast.
 2. Escutcheons: Wrought, Forged, or Cast.
 3. Dummy Trim: Match lever lock trim and escutcheons.
- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 1. Mortise Locks: Minimum 3/4-inch latch bolt throw.
- E. Rabbeted Meeting Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- F. Backset: 2-3/4 inches, unless otherwise indicated.
- G. Strikes: Manufacturer's standard strike with strike box for each latch bolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
 1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
 4. Strikes for Auxiliary Deadlocks: BHMA A156.5.
- H. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
 1. Mortise Locks: BHMA A156.13.
- I. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1; Series 1000.
 1. Manufacturers:
 - a. Best Access Systems; Div. of The Stanley Works.
 - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - d. Trilogy; an Alarm Lock Systems, Inc. Company
 - e. Or approved equal.

2.4 KEYLESS ACCESS CONTROL

- A. Operation: Clutch mechanism permits turning lever without retracting latch and reduces stress on the spindle. Entering access code, presenting prox card or key bypass, or remote bypass will allow lever to retract latch. Inside panic bar always provides instant egress. (Temperature Range: +150°F to -20° F.)
- B. Door Thickness: 13/4" standard. Other thickness please see ordering information and/or consult factory.
- C. Keypad: Vandal-resistant all metal, weather-resistant 12-button programmable for multi-level access functions including group or individual user codes, master and management codes, passage and emergency or service code, lockout and remote override capability and allowable entry time for 5 to 15 seconds. (Completely encapsulated circuit board hermetically sealed from weather and elements.)

- D. Audit Trail: Locks' entry activity log can be polled to the Data Transfer Module (AL-DTMII), any PC using Alarm Lock's DL-WINDOWS Software (Vsn.2.94 or higher), and/or can be on-site printed using the hand-held infrared printer (AL-IR1). Interchangeable Core Models: Accepts 6 & 7 Pin Cylinders from: Best, Arrow, KSP, Medeco, Keymark & KabaPeaks. Also available IC Core models for Yale, Medeco, Sargent, Corbin/Ruswin CL and Schlage. Alarm lock tailpiece is supplied; IC Core is not included.
- E. Cylinder: Requires separately available Cylinder Adapter Kit.
- F. Handing: Non-handed, field reversible
- G. Compliances: Use of the Alarm Lock TrilogyExit does not alter or invalidate the UL Safety or Fire Ratings of the Panic Exit Device you are using (when properly installed per Alarm Lock's instruction sheet).
- H. Finishes: US3 polished brass, US26D satin chrome, US26 polished chrome, 10B Duronodic, US5 Antique Brass.
- I. Power: 5 AA alkaline batteries, (supplied) installed in Battery Pack. Audible low battery alert, visual and audible entry indicators

2.5 DOOR BOLTS

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Flush Bolts: Minimum 3/4-inch throw.
- B. Dustproof Strikes: BHMA A156.16, Grade 1.
- C. Manual Flush Bolts: BHMA A156.16, Grade 1; designed for mortising into door edge.
 - 1. Manufacturers:
 - a. Burns Manufacturing Incorporated.
 - b. Hager Companies.
 - c. IVES Hardware; an Ingersoll-Rand Company.
 - d. Or approved equal.

2.6 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1
- B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 1. Operation: Rigid.
- F. Outside Trim: Lever with cylinder; material and finish to match locksets, unless otherwise indicated.
 - 1. Match design for locksets and latch sets, unless otherwise indicated.

2.7 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade 1.
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Seven
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
- a. Replace construction cores with permanent cores as directed by Owner.

E. Manufacturers:

1. Best Access Systems; Div. of The Stanley Works.
2. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
3. SARGENT Manufacturing Company; an ASSA ABLOY Group company
4. Trilogy; an Alarm Lock Systems, Inc. Company
5. Or approved equal.

2.8 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:

1. Existing System: Master key or grand master key locks to Owner's existing system.

B. Keys: Nickel silver.

1. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.

2.9 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with ANSI A117.1.

1. Comply with the following maximum opening-force requirements:

- a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.

- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

- C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

- D. Surface Closers: BHMA A156.4, Grade 1. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. Manufacturers:

- a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
- b. LCN Closers; an Ingersoll-Rand Company.
- c. Norton Door Controls; an ASSA ABLOY Group company.
- d. Or approved equal.

2.10 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches less than door width on push side by 8" high.

- B. Fasteners: Manufacturer's standard stainless steel machine or self-tapping screws.

- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:

1. Material: 0.050-inch thick stainless steel.

2. Manufacturers:

- a. Burns Manufacturing Incorporated.
- b. IVES Hardware; an Ingersoll-Rand Company.
- c. Rockwood Manufacturing Company.
- d. Or approved equal.

2.11 DOOR GASKETING

- A. Standard: BHMA A156.22.
- B. General: Provide continuous weather-strip gasketing on exterior doors. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing, as tested according to ASTM E 283.
- D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- E. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- F. Manufacturers:
 - 1. National Guard Products.
 - 2. Pemko Manufacturing Co.
 - 3. Reese Enterprises.
 - 4. Or approved equal.

2.12 THRESHOLDS

- A. Standard: BHMA A156.21.
- B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with ANSI A117.1.
 - 1. Bevel raised thresholds with a slope of not more than 1:2.
 - 2. Comply with NFPA 101. Maximum 1/2 inch high.
- C. Manufacturers:
 - 1. National Guard Products.
 - 2. Pemko Manufacturing Co.
 - 3. Reese Enterprises.
 - 4. Or approved equal.

2.13 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Steel Machine Screws: For the following applications:

- a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

2.14 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors and door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SETS

SET #01 - Single Door Electrical Room RHR

Opening Description: 3'0" x 7'0" x FRP Type FRP

<u>Item</u>	<u>Description</u>	<u>Finish</u>	<u>Manufacturer</u>
1 Continuous Hinge	790-915 83"	US32D	Hager
1 Exit Device	18 R L DANE	RHR 32D	Monarch
1 Keyed Access	47H 7A15M-Escutcheon J S6	630	Best
1 Closer	4041 CUSH SRI	AL	LCN Closer
1 Threshold	520S S 36"	MIL	Hager
1 Jamb Weather strip	896S S 1 x 36" 2 x 84"	MIL	Hager
1 Protective Trim Unit	8400	32D	Ives

SET #02 - Double Doors Sodium Hypochlorite Feed Room

RHRA

Opening Description: 2 - 3'0" x 7'0" x FRP Type FRP

<u>Item</u>	<u>Description</u>	<u>Finish</u>	<u>Manufacturer</u>
2 Continuous Hinge	790-915 83"	US32D	Hager
1 Exit Device	18 V L DANE LBR	RHR 32D	Monarch
1 Exit Device	18 V L DT DANE LBR	LHR 32D	Monarch
1 Keyed Access	47H 7A15M-Escutcheon J	630	Best
2 Closer	S6	AL	LCN Closer
1 Astragal	4041 CUSH SRI	Clear Anodized	National Guard
1 Sweep	115 NA	AL	National Guard
1 Threshold	200 NA	Clear Anodized	Hager
1 Jamb Weather strip	520S S 76"	AL	Hager
1 Set Weather strip	896S S 1 x 84" x 84"	MIL	Hager
2 Flush Bolts	882S B 84"	MIL	Ives
2 Protective Trim Units	458	CLR	Ives
	8400	26D	
		32D	

-- END OF SECTION --

DIVISION 09

FINISHES

SECTION 099000**PAINTING****PART 1 GENERAL****1.01 SUMMARY****A. Section Includes:**

1. Work under this section consists of surface preparation, priming, painting, and finishing work necessary to complete Work indicated or reasonably implied on Drawings.
2. Use high performance coating systems specified in this section to finish components, unless otherwise indicated. Without restricting volume or generality, work to be performed under this section may include, but is not limited to:
 - a. Interior wall and ceiling surfaces
 - b. Interior steel
 - c. Interior concrete floors
 - d. Opening frames and trims
 - e. Exterior concrete and concrete masonry
 - f. Exterior metal items
 - g. Piping, hangers, and supports
 - h. Exposed bare pipes (including color coding)
 - i. Electrical conduit, junction boxes, and other equipment
 - j. Shop-primed items exposed to view, including metal fabrications, equipment, lintels, metal doors and frames, access doors, hangers, and railings not scheduled to receive other finish treatments
 - k. Secondary Chemical Containment areas for chemical storage tanks, chemical totes, and chemical feed pump systems
3. Painting or finishing is not needed for the following:
 - a. Stainless steel piping, stainless steel equipment, stainless steel equipment supports, concrete tank interiors, fiberglass tank baffles, metal grating and stairs, aluminum railings, galvanized structural steel members. Surfaces or materials specifically scheduled or shown on Drawings to remain unfinished.
 - b. Items provided with factory finish.
 - c. Equipment nameplates, fire rating labels, and operating parts of equipment.
4. Materials and products having factory-applied primer shall not be considered factory finished.

B. Related Sections - All Divisions**1.02 REFERENCES**

- A. Publications listed herein are part of this specification to extent referenced.
- B. American National Standards Institute
 1. ANSI A13.1 Scheme for the Identification of Piping Systems

2. ANSI Z535.1 Safety Color Code
- C. ASTM International (formerly American Society for Testing and Materials)
1. ASTM D16 Terminology Relating to Paint, Varnish, Lacquer, and Related Products
 2. ASTM D4263 - Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
ASTM F 1869 - Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 3. ASTM D4442 - Test Methods for Direct Moisture Content of Wood and Wood-Base Materials
- International Concrete Repair Institute (ICRI) Guideline No. 310.2-1997 (formerly 03732)
- Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- D. National Fire Protection Association
1. NFPA 101 Life Safety Code
 2. GNAPF 500-03-04 Abrasive Blast Cleaning.
- E. SSPC: The Society for Protective Coatings (formerly the Steel Structures Painting Council):
1. SSPC SP-1 Specification for Solvent Cleaning
 2. SSPC SP-2 Specification for Hand Tool Cleaning
 3. SSPC SP-3 Specification for Power Tool Cleaning
 4. SSPC SP-5 Specification for White Metal Blast Cleaning
 5. SSPC SP-6 Specification for Commercial Blast Cleaning
 6. SSPC SP-7 Specification for Brush-Off Blast Cleaning
 7. SSPC SP-10 Specification for Near White Metal Blast Cleaning
 8. SSPC SP-11 Specification for Power Tool Cleaning to Bare Metal
 9. SSPC-SP 13/NACE 6 - Surface Preparation of Concrete.
 10. SSPC-SP 15 Commercial Grade Power Tool Cleaning
 11. SSPC-SP 16 Brush-Off Blast Cleaning of Non-Ferrous Metals
 12. SSPC PA-1 Painting Application Specification
 13. SSPC PA-2 Paint Thickness Measurement

1.03 DEFINITIONS

- A. Terms 'Paint' or 'Painting' shall in a general sense have reference to sealers, primers, oil, alkyd, latex, polyurethane, epoxy, and enamel type coatings and application of these materials.
- B. Dry Film Thickness (DFT): Thickness, measured in mils, of a coat of paint in cured state.
- C. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 SUBMITTALS

- A. Product Data
 1. Submit manufacturer's literature describing products to be provided, giving manufacturer's name, product name, and product line number for each material.

2. Submit technical data sheets for each coating, giving descriptive data, curing times, mixing, thinning, and application requirements.
 - a. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin, and pigment.
 3. Submit manufacturer's Material Safety Data Sheets (MSDS) and other safety requirements.
- B. Shop Drawings
1. Submit a complete list of products proposed for use, including identifying product names and catalog numbers.
 - a. Arrange in same format as Schedule of Paint Finishes below.
 - b. Include applicable manufacturer's data and recommendations.
- C. Samples
1. Selection Samples
 - a. Submit color charts displaying manufacturer's full range of standard colors for initial selection by Engineer and Owner.
 2. Verification Samples
 - a. Submit 3 samples of each coating and color selected, showing bare, prepared surface and each successive coat.
 - b. Samples shall be submitted on hardboard or metal as appropriate to coating system. Label samples on back, identifying manufacturer, product name, and color number.
 - c. Sample Size: Not less than 12" x 12" (300 mm x 300 mm)

1.05 QUALITY ASSURANCE

- A. Qualifications
1. Provide products from a company specializing in manufacture of high performance coatings with a minimum of 10 years experience.
 2. Applicator shall be trained in application techniques and procedures of coating materials and shall demonstrate a minimum of 2 years successful experience in such application.
 - a. Maintain, throughout duration of application, a crew of painters who are fully qualified to satisfy specified qualifications.
1. Single Source Responsibility
- a. Materials shall be products of a single manufacturer or items standard with manufacturer of specified coating materials.
 - b. Provide secondary materials that are produced or are specifically recommended by coating system manufacturer to ensure compatibility of system.
- B. Regulatory Requirements

1. Conform to applicable codes and ordinances for flame, fuel, smoke, and volatile organic compound (VOC) ratings requirements for finishes at time of application.

C. Pre-Installation Meetings

1. Schedule a conference and inspection to be held on-site before field application of coating systems begins.
2. Conference shall be attended by Contractor, Owner's representative, Engineer, coating applicators, and a representative of coating material manufacturer.
3. Topics to be discussed at meeting shall include:
 - a. A review of Contract Documents and accepted shop drawings shall be made and deviations or differences shall be resolved.
 - b. Review items such as environmental conditions, surface conditions, surface preparation, application procedures, and protection following application.
 - c. Establish which areas on-site will be available for use as storage areas and working area.
4. Pre-construction conference and inspection shall serve to clarify Contract Documents, application requirements and what work should be completed before coating application can begin.
5. Prepare and submit, to parties in attendance, a written report of pre-installation conference. Report shall be submitted with 3 days following conference.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading

1. Deliver products in manufacturer's original unopened containers. Each container shall have manufacturer's label, intact and legible. Containers shall fully identify brand, type, grade, class, and other qualifying information used to describe contents.
2. Include on label for each container:
 - a. Manufacturer's name
 - b. Type of paint
 - c. Manufacturer's stock number
 - d. Color name and number
 - e. Instructions for thinning, where applicable

B. Storage and Protection

1. Store materials in a protected area, away from construction activities. Restrict storage area to paint materials and related equipment.
2. Maintain temperature in area of storage between 40 degrees F (4 degrees C) and 110 degrees F (43 degrees C).
3. Comply with health and fire safety regulations.
4. Remove damaged materials from Site.

1.07 PROJECT CONDITIONS

A. Environmental Requirements

1. Apply coating materials under conditions as follows:

- a. Air temperature shall not be below 35 degrees F (2 degrees C) or above 110 degrees F (43 degrees C).
- b. Refer to specific product information sheets for minimum surface temperature requirements. Surface temperatures shall be at least 5 degrees F (15 degrees C) above dew point and in a rising mode.
- c. Relative humidity shall be no higher than 85%.
- d. For exterior spray application, wind velocity shall be less than 15 mph.
- e. Atmosphere shall be relatively free of airborne dust.

1.08 SEQUENCING

A. Coordination

1. Perform work in proper sequence with work of other trades to avoid damage to finished work.
2. Where coatings are scheduled to be applied over shop-applied coatings, coordinate work of such shop applied products to ensure compatibility with field applied coating systems.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. To define requirements for materials, size, and design, this specification lists specific products manufactured by Tnemec Company, Inc. of Kansas City, Missouri, or Sherwin-Williams, Cleveland, Ohio. Materials specified herein are cited as minimum standard of quality which will be acceptable: Tnemec; Carboline; Sherwin Williams; Rust-Oleum, or approved equal.
- B. Materials specified herein shall not preclude consideration of equivalent or superior materials. Suggested equivalent materials or other substitutions shall be submitted to Engineer for consideration.
 1. Requests for substitution shall include evidence of satisfactory past performance on water and wastewater treatment facilities.
 2. Substitutions will not be considered that change number of coats or do not meet specified total dry film thickness.

2.02 ACCESSORIES

A. Coating Application Accessories

1. Provide application accessories as indicated in coating manufacturer's application instructions, including but not limited to cleaning agents, etching agents, cleaning cloths, sanding materials, and clean-up materials.
2. Material not specifically identified, but needed for proper application shall be of a quality not less than specified products.

2.03 SHOP FINISHING

A. Surface Preparation

1. Clean surfaces of loose scale, rust, oil, dirt, and other foreign matter, immediately prior to priming. Surfaces to be coated shall be clean, dry, smooth, and free from dust and foreign matter that will adversely affect adhesion or appearance.
2. Prior to application of primer, steel surfaces shall be prepared to receive coating system in compliance with manufacturer's recommendations and specifications of SSPC as indicated in Schedule of Coating Systems below.

B. Shop Applied Coatings

1. Steel members shall be provided with one coat of primer as indicated in Schedule of Coating Systems below. Application of first coat shall follow immediately after surface preparation and cleaning and within an eight hour working day. Cleaned areas not receiving first coat within an eight hour period shall be re-cleaned prior to application of first coat.
2. Apply materials at film thickness specified by methods recommended by manufacturer in compliance with SSPC PA-1.
3. Allow each coat of paint to dry thoroughly before applying succeeding coats.
4. Make finish topcoats smooth, uniform in color, and free of laps, runs, dry spray, over-spray, and skipped or missed areas.
5. Environmental conditions shall be in compliance with coating manufacturer's printed instructions.

2.04 SOURCE QUALITY CONTROL

A. Testing Laboratory Services

1. Documents
 - a. Review Contract Documents and applicable sections of referenced standards.
2. Shop Painting Inspection
 - a. Verify cleaning operations to surfaces are to condition specified.
 - b. Verify conformance of paint to specification.
 - c. Check for thickness of each coating, final thickness, and holidays.
 - d. Check touch-up for final finish.
3. Reports
 - a. Submit written progress reports describing tests and inspections made and showing action taken to correct non-conforming work. Report uncorrected deviations from Contract Documents.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions

1. Examine areas and conditions under which application of coating systems shall be performed for conditions that will adversely affect execution, permanence, or quality of coating system application.

2. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes until moisture content of surface is below following limits:
 - a. Masonry Surfaces: 12% maximum
 - b. Vertical Concrete Surfaces: 12% maximum
 - c. Horizontal Concrete Surfaces: 8% maximum
 - d. Gypsum Board Surfaces: 12% maximum
 - e. Wood Surfaces: 15% maximum; in compliance with ASTM D4442
3. Correct conditions detrimental to timely and proper execution of Work.
4. Do not proceed until unsatisfactory conditions have been corrected.
5. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Protection

1. Take precautionary measures to prevent fire hazards and spontaneous combustion. Remove empty containers from Site.
2. Place cotton waste, cloths, and hazardous materials in containers, and remove from Site daily.
3. Provide drop cloths, shields, and other protective equipment.
4. Protect elements surrounding work of this section from damage or disfiguration.
5. As Work proceeds, promptly remove spilled, splashed, or splattered materials from surfaces.
6. During application of coating materials, post Wet Paint signs.
7. During application of solvent-based materials, post No Smoking signs.

B. Surface Preparation

1. General Requirements
 - a. Prior to application of primer, surfaces shall be prepared to receive specified coating system in compliance with manufacturer's recommendations and specifications of SSPC as indicated in Schedule below.
 - b. Clean surfaces of residual deposits of grease, scale, rust, oil, dirt, and other foreign matter, immediately prior to priming. Surfaces to be coated shall be clean, dry, smooth, and free from dust and foreign matter that will adversely affect adhesion or appearance.
2. Ferrous Metal Surfaces
 - a. Surfaces shall be free of residual deposits of grease, rust, scale, dirt, dust, oil, and weathered coating.
 - b. For shop primed surfaces, sand and scrape to remove loose and/or weathered primer and rust. Feather edges to make touch-up patches inconspicuous. Field welds and touch-ups shall be prepared to conform to original surface preparation standards as indicated in Schedule of Coating Systems below.
 - c. Shop applied prime coatings that are damaged during transportation, construction, extended field exposure and/or installation shall be thoroughly cleaned and touched up in field. Use repair procedures that insure complete protection of adjacent primer. Repair methods and equipment may include wire brushing, hand or power tool cleaning, pressure washing and/or dry air blast cleaning. In order to prevent

injury to surrounding painted areas, blast cleaning may necessitate use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking. If damage is too extensive to tough-up, item shall be re-cleaned and coated or painted.

- d. For surfaces not shop primed, surfaces shall be cleaned in compliance with specifications of Steel Structures Painting Council as indicated in Schedule of Coating Systems below.
3. Galvanized Steel Surfaces
 - a. Prepare in accordance with SSPC-SP 16.
 - b. Sand clean and spot prime abraded areas.
 4. Lightweight Metals
 - a. Prepare in accordance with SSPC-SP 16.
 5. Cast-In-Place and/or Precast Concrete Surfaces: Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 310.2.
 - a. Allow concrete to cure for not less than 30 days prior to painting.
 - b. Remove loose particles with stiff brush.
 - c. Remove dirt, scale, efflorescence, powders, laitance, parting compounds, and other foreign matter.
 - d. Wash stains caused by weathering or corroding metals with a sodium metasilicate solution after thoroughly wetting with clean, clear water; allow surface to thoroughly dry.
 - e. Fill small surface pock marks and air holes with a suitable fill material. Thoroughly brush or rub over surface and let dry for not less than 24 hours before paint application.
 6. Submerged Concrete (Void-free surface): Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 310.2.
 - a. Remove oil, grease and contaminants by solvent cleaning.
 - b. Brush blast entire surface to remove laitance, form coatings, provide a uniform surface texture in accordance with the ICRI 310.2 CSP required by the manufacturer.
 - c. Perform blast cleaning so as to open up voids and bug holes so that holes are concave. Care should be taken to keep aggregate exposures to a minimum.
 - d. Voids up to 1/2" (13 mm) in depth and/or 2" (50 mm) in diameter shall be filled and patched with a cementitious product compatible with next coat applied or Sherwin-Williams Steel-Seam FT910 or Tnemec Series 63-1500 Filler and Surfacer.
 7. Masonry Surfaces (facing brick or concrete masonry units)
 - a. Allow surfaces to cure for not less than 30 days prior to painting.
 - b. Remove dirt, loose mortar, scale, efflorescence, or powder.
 8. Cement Plaster (stucco)
 - a. Allow surfaces to cure for 30 to 60 days prior to painting.
 - b. Fill minor isolated hairline cracks with patching plaster and smooth off to match texture of adjacent surfaces.

- c. Remove dirt, loose material, scale, efflorescence, powder, and other foreign matter. Remove oil and grease by washing with a tri-sodium phosphate solution, rinse with clean, clear water and let thoroughly dry.
 - d. For solvent based paints, wash surfaces with a 4% zinc sulphate solution, rinse with clean, clear water, and let thoroughly dry before painting.
9. Moisture Emission Test for Concrete and Masonry
- a. Test substrates for moisture prior to application of coating systems. Test shall be plastic sheet method in compliance with ASTM D4263 and, if necessary, F 1869.
10. Gypsum Wallboard Surfaces:
- a. Fill narrow, shallow cracks and small holes with spackling compound.
 - b. Rake deep, wide cracks and deep holes; dampen with clean, clear water and fill with thin layers of joint cement.
11. Copper Surfaces:
- a. Clean surfaces in accordance with SSPC-SP 16.
12. Stainless Steel Surfaces:
- a. Clean surfaces in accordance with SSPC-SP 16.
13. Concrete Floors: Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 310.2.
- a. Allow concrete to cure for 30 days prior to painting.
 - b. Remove contamination, dirt, dust, and other foreign matter from concrete floors.
 - c. Brush-Off-Blast or Vacuum Blast Clean to achieve a uniform surface profile in accordance with the ICRI 310.2 CSP required by the manufacturer...
 - d. After surface treatment, keep traffic off surfaces until painting.
14. Wood Surfaces
- a. Sand wood surfaces and edges smooth and even before finishing or painting and between coats. Remove dust after each sanding.
 - b. Remove residue from knots, pitch streaks, cracks, open joints, and sappy spots. Knots shall be coated with a pigmented stain sealer prior to painting. Avoid use of shellac as an undercoat.
 - c. Countersink nails and fill nail holes, cracks, open joints and other defects with tinted putty or wood filler after priming is dry and before second coat.
15. Insulated Coverings, Canvas or Cotton
- a. Clean using high-pressure air and solvent of type recommended by coating manufacturer.
16. Polyvinyl Chloride (PVC) Pipe
- a. Remove ink markings by wiping down with clean-lint-free cloths saturated denatured alcohol.

3.03 APPLICATION

A. General Requirements

1. Apply coating systems in compliance with manufacturer's instructions and using application method best suited for obtaining full, uniform coverage of surfaces to be coated.
2. Apply primer, intermediate, and finish coats to comply with wet and dry film thickness and spreading rates for each type of material as recommended by manufacturer.
 - a. Application rates in excess of those recommended and fewer numbers of coats than specified shall not be accepted.
3. Number of coats specified shall be minimum number acceptable. Apply additional coats as needed to provide a smooth, even application.
 - a. Closely adhere to re-coat times recommended by manufacturer. Allow each coat to dry thoroughly before applying next coat. Provide adequate ventilation for tank interior to carry off solvents during drying phase.
4. Employ only application equipment that is clean, properly adjusted, and in good working order, and of type recommended by coating manufacturer.
5. After surface preparation, interior weld seams shall be brush applied.
6. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping.
7. Finish tops, bottoms and edges of doors same as faces of doors.
8. Piping and Conduit Exposed to View
 - a. Finish in compliance with requirements for unprimed ferrous metal items.
 - i) Use colors specified in ANSI Z13.1 and Z535.1 or the Ten States Standards Guide.
 - b. Identification markings will be provided by others.
9. Access Panels, Electrical Panels, and Cover Plates:
 - a. Finish in compliance with requirements for shop-primed ferrous metal items, including doors, door backs and sight-exposed cabinet surfaces, color matching adjacent surfaces unless otherwise indicated; do not allow coatings on identification plates, tags, or markings.

3.04 REPAIR/RESTORATION

- A. At completion of Work, touch-up and restore finishes where damaged.
- B. Defects in Finished Surfaces
 1. When stain, dirt, or undercoats show through final coat, correct defects and cover with additional coats until coating is of uniform finish, color, appearance and coverage.
 2. Correct defects visible from a distance of 5 feet. Runs shall not be permitted.
- C. Touch-up of minor damage shall be acceptable where result is not visibly different from surrounding surfaces. Where result is visibly different, either in color, sheen, or texture, recoat entire surface.

3.05 FIELD QUALITY CONTROL**A. Required Inspections and Documentation**

1. Documents
 - a. Review Contract Documents and applicable sections of referenced standards.
2. Field Painting Inspection:
 - a. Verify cleaning operations to surfaces are to condition specified.
 - b. Verify conformance of paint to specification.
 - c. Check for thickness of each coating, final thickness, and holidays.
 - d. Check touch-up for final finish.
3. Reports
 - a. Submit written progress reports describing tests and inspections made and showing action taken to correct non-conforming work. Report uncorrected deviations from Contract Documents.

B. Manufacturer's Field Service

1. Coatings manufacturer shall be available to provide on-site inspections, technical assistance, and guidance for application of coating system as needed.

3.06 CLEANING

- A. At completion of day's work, remove from Site rubbish and accumulated materials.
- B. Clean paint spots and other soiling from prefinished surfaces and surfaces with integral finish. Use solvents which will not damage finished surface.
- C. Leave storage area clean and in same condition indicated for equivalent spaces in Project.

3.07 PROTECTION

- A. Protect work against damage until fully cured. Provide signs identifying wet surfaces until surfaces are adequately cured.

3.08 WASTE MANAGEMENT

- A. General Requirements
 1. Place materials defined as hazardous or toxic waste in designated containers.
 2. Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal.
 3. Do not dispose of paints or solvents by pouring on ground. Place in designated containers for proper disposal.
 4. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

3.09 SCHEDULE OF COATING SYSTEMS

- A. Previously Painted Surfaces (existing facility). NOT USED
- B. Carbon Steel (structural steel, miscellaneous metal, tanks, pipes, and equipment)
 - 1. Exterior Steel - Non-Immersion
 - a. Shop Surface Preparation: SSPC SP6 Commercial Blast Cleaning
 - b. Shop and Spot Field Primer Coat: Corothane I Galvapac or Series 91H20
 - i) Dry Film Thickness: 2.5 to 3.5 mils
 - c. Full Field Intermediate Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 5.0 mils
 - d. Finish Coat: Acrolon Ultra, Hi-Solids Polyurethane, or Series 1075-color Endura-Shield
 - i) Dry Film Thickness: 2.5 to 5.0 mils
 - e. Total Dry Film Thickness: 8.0 to 13.5 mils.
 - 1. Interior Steel - Non-Immersion (moderate chemical and dry exposure) for Structural Steel, pumps, valves, mechanical equipment, etc.)
 - a. Shop Surface Preparation: SSPC SP6 Commercial Blast Cleaning
 - b. Shop Primer Coat: Corothane I Galvapac or Series 91H20
 - i) Dry Film Thickness: 2.5 to 3.5 mils
 - c. Full Field Prime Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 5.0 mils
 - d. Finish Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 5.0 mils
 - e. Total Dry Film Thickness: 7.5 to 13.5 mils.
 - 2. Interior Steel - Immersion – Potable Water - NOT USED
 - 5. Exterior Steel – Immersion, Clarifier Rake arms etc., Non-Potable:
 - a. Shop Surface Preparation: SSPC SP10 Near White Blast Cleaning
 - b. OPTIONAL Shop Primer Coat: Copoxy, Dura-Plate 235, or Series N69
 - i) Dry Film Thickness: 3.0 to 5.0 mils
 - c. Field Surface Preparation: SSPC-SP 10 or Pressure Wash Shop Primer and sweep blast to remove surface contamination. SSPC SP15 any damaged primer or welded connections. Spot prime with shop primer.
 - d. Full Field Prime Coat: Sher-Glass FF or Series 104
 - i) Dry Film Thickness: 8.0 to 12.0 mils
 - e. Finish Coat Sher-Glass FF or Series 104
 - i) Dry Film Thickness: 8.0 to 12.0 mils
 - f. Total Dry Film Thickness: 16.0 to 24.0 mils.
 - 6. Interior or Exterior Steel - Immersion; Non-Potable – NOT USED?

Note: For exposures to hydrogen sulfide, sulfuric acid and industrial waste condensates.

 - a. Surface Preparation: SSPC SP5 White Metal Blast Cleaning
 - i) Minimum Anchor Pattern: 3.0 mils
 - b. Primer Coat: Cor-Cote SC or Series 435
 - i) Dry Film Thickness: 15.0 to 20.0 mils
 - c. Finish Coat: Cor-Cote SC or Series 435
 - i) Dry Film Thickness: 15.0 to 20.0 mils

- d. Total Dry Film Thickness: 30.0 to 40.0 mils
- 7. Interior or Exterior Steel - NOT USED
- C. Mill Coated Ductile Iron Pipe; Non-Potable
 - 1. Exterior or Interior - Non-Immersion:
 - a. Shop Surface Preparation: NAPF 500-03-04 with the exception that ALL rust and mold coating be removed. Only tightly adherent annealing oxide may remain.
 - b. Shop Primer Coat: Copoxy, Macropoxy 646, or Series N69-1211
 - i) Dry Film Thickness: 3.0-5.0 dry mils
 - c. Field Surface Preparation: Pressure Wash Shop Primer to remove surface contamination. SSPC SP3 any damaged primer or welded connections. Spot prime with shop primer.
 - d. Full Field Intermediate Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 5.0 mils
 - e. Exterior Finish Coat: Acrolon Ultra, Hi-Solids Polyurethane, or Series 1075 Endura-Shield
 - i) Dry Film Thickness: 2.5 to 5.0 mils
 - f. Interior Finish Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 5.0 mils
 - g. Total Dry Film Thickness: 8.0 to 13.5 mils
 - 2. Exterior or Interior - Immersion; Potable – NOT USED
- D. Galvanized Steel - Pipe, Metal Deck, and Miscellaneous Fabrications
 - 1. Exterior
 - a. Surface Preparation: SSPC-SP16.
 - b. Spot Prime Coat: Corothane I Galvapac or Series 91H20 (galvi touch-up only)
 - i) Dry Film Thickness: 2.5 to 3.5 mils
 - c. Full Intermediate Coat: Macropoxy 646 or Series N69 Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 4.0 mils
 - d. Full Finish Coat: Acrolon Ultra, Hi-Solids Polyurethane, or Series 1075 Endurashield
 - i) Dry Film Thickness: 2.5 to 5.0 mils
 - e. Total Dry Film Thickness: 8.0 to 12.5 mils
 - 2. Interior
 - a. Surface Preparation: SSPC-SP16.
 - b. Primer Coat: Corothane I Galvapac or Series 91H20 (touch-up only)
 - i) Dry Film Thickness: 2.5 to 3.5 mils
 - c. Full Intermediate Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 4.0 mils
 - d. Finish Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 3.0 to 4.0 mils
 - e. Total Dry Film Thickness: 8.5 to 11.5 mils
- E. Concrete (cast-in-place and/or precast concrete surfaces)

1. Do not paint exterior cast-in-place or precast concrete structures.
3. Interior - Non-Immersion
 - a. Surface Preparation: SSPC-SP 13/NACE 6 to achieve a surface profile of ICRI CSP 2 or 3
 - b. First Coat: Pro-Industrial Waterborne Catalyzed Epoxy or Series 113/114
 - i) Dry Film Thickness: 2.0 to 4.0 mils
 - c. Second Coat: Pro-Industrial Waterborne Catalyzed Epoxy or Series 113/114 i)
 - Dry Film Thickness: 3.0 to 4.0 mils
 - d. Total Dry Film Thickness: 5.0 to 8.0 mils.

F. Concrete Floors (Secondary Chemical Containment)

FOR THE CHEMICAL FEED ROOM AND CONTAINMENT AREA FOR SODIUM HYPOCHLORITE SHALL BE PER THE SPECIFICATION AT THE END OF THIS SECTION

1. Pigmented Finish
 - a. Surface Preparation: SSPC-SP 13/NACE 6 with a surface profile of ICRI CSP 4 or 5
 - b. First Coat: Corobond 100 or Series 201 Primer
 - i) Dry Film Thickness: 4.0 to 6.0 mils
 - a. Second Coat: Cor-Cote HCR FF or Series 270 Stranlok.
 - i) Dry Film Thickness: 15.0 – 20.0 mils.
 - d. Finish Coat: Cor-Cote HCR FF or Two coats of Series 282 Gray Theme-Glaze
 - i) Dry Film Thickness: 15.0 to 20.0 mils
 - e. Total Dry Film Thickness: 34.0 to 46.0 mils
 - f. For non-skid surface, add or broadcast silica sand 50 to 70 mesh at 5 pounds per gallon, or as recommended by manufacturer to second coat.
2. Pigmented Epoxy: Lab floors
 - a. Surface Preparation: Brush-off blast or vacuum blast cleaning
 - b. First Coat: General Polymers 3579 Primer or Series 280 (color)
 - i) Dry Film Thickness: 8.0 to 10.0 mils
 - c. Second Coat: General Polymers 3745 Topcoat or Series 280 (color)
 - i) Dry Film Thickness: 8.0 to 10.0 mils
 - d. Total Dry Film Thickness: 16.0 to 20.0 mils

G. Concrete Masonry Unit (CMU)

1. Exterior – Exposed
 - a. Surface Preparation: Surface shall be clean and dry
 - b. First Coat: Loxon XP or Series 156 Envirocrete
 - i) Dry Film Thickness: 6.0 to 8.0 mils (100 to 134 square feet/gallon)
 - c. Second Coat: Loxon XP or Series 156-color Enviro-Crete
 - i) Dry Film Thickness: 6.0 to 8.0 mils (100 to 134 square feet/gallon)
 - d. Total Dry Film Thickness: 12.0 to 16.0 mils
2. Interior: CMU
 - a. Surface Preparation: Surface shall be clean and dry

- b. First Coat: Cement Plex 875 or Series 130 Envirofill
 - i) Dry Film Thickness: 14.0 to 18.0 mils (60 to 80 square feet/gallon)
- c. Second Coat: Pro-Industrial Waterborne Catalyzed Epoxy or Series 113/114
 - i) Dry Film Thickness: 2.0 to 4.0 mils
- d. Third Coat: Pro-Industrial Waterborne Catalyzed Epoxy or Series 113/114
 - i) Dry Film Thickness: 3.0 to 4.0 mils
- e. Total Dry Film Thickness: 5.0 to 8.0 mils above block filler.

H. Interior Wall and Ceiling Surfaces

1. Gypsum Wallboard

- a. Surface Preparation: Surface shall be clean and dry
- b. First Coat: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer or Series 51-792 PVA
 - i) Dry Film Thickness: 1.0 to 1.5 mils
- c. Second Coat: Pro-Industrial Waterborne Catalyzed Epoxy or Series 113 Tufcoat
 - i) Dry Film Thickness: 2.0 to 4.0 mils
- d. Finish Coat: Pro-Industrial Waterborne Catalyzed Epoxy or Series 113 Tufcoat
 - i) Dry Film Thickness: 3.0 to 4.0 mils
- e. Total Dry Film Thickness: 6.0 to 9.5 mils

I. Wood

1. Interior or Exterior:

- a. Surface Preparation: Surface shall be clean and dry
- b. First Coat: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer or Series 10-99W Undercoater at 1.0 - 3.5 mils dft.
 - i) Dry Film Thickness: 2.0 to 3.5 mils
- c. Second Coat: Pro-Industrial High Performance Acrylic, KemBond HS, or Series 2H-Color Enduratone
 - i) Dry Film Thickness: 2.5 to 3.5 mils
- d. Third Coat: Pro-Industrial High Performance Acrylic, KemBond HS, or Series 2H-Color Enduratone
 - i) Dry Film Thickness: 2.5 to 3.5 mils
- e. Total Dry Film Thickness: 6.0 to 11.5 mils

J. PVC Pipe

1. Exterior or Interior

- a. Surface Preparation: Surface shall be clean and dry; scarify surface uniformly.
- b. First Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 2.0 to 3.0 mils
- c. Exterior Finish Coat: Acrolon Ultra, Hi-Solids Polyurethane, or Series 1075 Endura-Shield
 - i) Dry Film Thickness: 2.0 to 3.0 mils
- d. Interior Finish Coat: Macropoxy 646 or Series N69-color Hi-Build Epoxoline
 - i) Dry Film Thickness: 2.0 to 3.0 mils
- e. Total Dry Film Thickness: 4.0 to 6.0 mils

K. Insulated Pipe

1. Interior

- a. Surface Preparation: Surface shall be clean and dry.
- b. First Coat: DTM Acrylic Primer/Finish or Series 6-Color Tneme-Cryl
 - i) Dry Film Thickness: 2.0 to 3.0 mils
- e. Second Coat: DTM Primer/Finish or Series 6-Color Tneme-Cryl
 - i) Dry Film Thickness: 2.0 to 3.0 mils
- f. Total Dry Film Thickness: 4.0 to 6.0 mils

L. Fiberglass Reinforced Plastic Pipe

1. Exterior

- a. Surface Preparation: Surface shall be clean and dry; lightly sand surface using 120-grit sandpaper.
- b. First Coat: Macropoxy 646 or Series N69 Epoxoline
 - i) Dry Film Thickness: 3.0 to 5.0 mils
- c. Second Coat: Acrolon Ultra, Hi-Solids Polyurethane, or Series 1075 Endurashield
 - i) Dry Film Thickness: 2.0 to 3.0 mils
- d. Total Dry Film Thickness: 5.0 to 8.00 mils

3.11 SCHEDULE OF COLOR SYSTEM MATERIAL IDENTIFICATION – WASTEWATER SYSTEMS

- A. Colors as follows have been used successfully in wastewater treatment facilities for identification of various materials contained in tanks and pipes. SEE ATTACHED Ten States Identification with Sherwin-Williams Colors. A legend showing the name and contents of each pipe and an arrow showing the direction of flow shall be located on each pipe listed in the Piping Identification Schedule. The legends shall be stenciled on the pipes and shall be located on straight runs and at each valve, piece of equipment, branches, changes in direction, and where pipes pass through walls or floors and as directed by the Engineer. The size and location of the legend shall be in general accordance with American National Standards Institute Scheme for Identification of Piping Systems, A13.1-1975 and the Recommended Standards for Wastewater Facilities prepared by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (10 States' Standards). Engineer shall select the desired shades of the process piping color. Pumps, meters, etc. associated with the process piping shall also be painted the same color as the lines in which they are a part as selected by the Engineer.

COLOR CODING SCHEDULE

Service	Generic Color	Color Identification
Fire Protection (including hydrants)	red	SC09 Safety Red
Plant Water (including hydrants)	dark green	EN09 Balsam
Alum or Primary Coagulant	orange	SC03 Safety Orange
Liquid Sodium Bisulfite	yellow with green band	SC01 Safety Yellow with SC07 Safety Green band
Sodium Hypochlorite	yellow	SC01 Safety Yellow
Polymers or Coagulant Aids	light purple	YB44 Purple Mauve
Potassium Permanganate	violet	SC08 Safety Purple
Compressed Air	green	SC07 Safety Green
Digester Gas	red	SC05 Monterrey Tile
Other Lines	light gray	IN01 Light Gray
Scum	brown	EN05 Weathered Bark
Return Activated Sludge	brown	EN05 Weathered Bark
Waste Activated Sludge	brown	EN05 Weathered Bark
Thickened Sludge	brown	EN05 Weathered Bark
Other Sludge	brown	EN05 Weathered Bark
Seal Water	dark green	EN09 Balsam
Filtrate	black	IN06 Black
Digester Supernatant	brown	EN05 Weathered Bark
Natural Gas	red	SC05 Monterrey Tile
Drains	black	IN06 Black
Cold City Water	dark blue	SC06 Safety Blue
Hot City Water	light blue	GB03 Delft Blue
Hoists/Trolleys	yellow	SC01 Safety Yellow

- B. Sample, drain, overflow, vent, metering, blow off, and other associated lines shall be painted the same code color as the piping system they serve.
- C. Existing surfaces, items of existing equipment, and piping which will require refinishing as a result of demolition and alteration work shall be repainted using the appropriate paint. Repainting shall not be limited to spot touch-up but shall include the painting of entire surfaces where demolition or alteration work has taken place.
- D. Insulated pipe jacketed with aluminum or stainless steel shall not be painted, but uninsulated valves and fittings on such lines shall be color coded in accordance with existing scheme utilized by the plant. Such piping shall be identified by bands of proper code color and by legend.
- E. Plumbing and HVAC lines, and electrical conduit exposed in finished areas, shall not be color coded but shall be painted the same color as the background to which they are adjacent, or as approved by engineer.
- F. Items of equipment connected to color coded systems shall be painted the same color as the system they serve.

-- END OF SECTION --

3.17 PIPE IDENTIFICATION AND COLOR CODING

A. A legend showing the name and contents of each pipe and an arrow showing the direction of flow shall be located on each pipe listed in the Piping Identification Schedule. The legends shall be stenciled on the pipes and shall be located on straight runs and at each valve, piece of equipment, branches, changes in direction, and where pipes pass through walls or floors and as directed by the Engineer. The size and location of the legend shall be in general accordance with American National Standards Institute Scheme for Identification of Piping Systems, A13.1-1975. Engineer shall select the desired shades of the process piping color. Pumps, meters, etc. associated with the process piping shall also be painted the same color as the lines in which they are a part as selected by the Engineer.

B. Piping Identification Schedule:

PAINT COLORS

PIPE SYSTEM	PIPE COLOR	LETTERS & ARROWS
WATER LINES		
Raw	Olive Green	Black
Settled or Clarified, RO Permeate	Aqua	Black
Finished or Potable	Dark Blue	Black
City Water (drinking water-hot & cold)	Dark Blue	Black
CHEMICAL LINES		
Alum or Primary Coagulant	Orange	Black
Ammonia	White	Black
Carbon Slurry	Black	White
Caustic	Yellow w/ Green Band	Black
Chlorine (Gas or Solution)	Yellow	Black
Fluoride	Light Blue w/ Red Band	Black
Lime Slurry	Light green	Black
Ozone	Yellow w/ Orange Band	Black
Phosphate Compounds	Light Green w/ Red Band	Black
Polymers or Coagulant Aids	Orange w/ Green Band	White
Potassium Permanganate	Violet	White
Soda Ash	Light Green w/ Orange Band	Black
Sulfuric Acid	Yellow w/ Red Band	Black
Sulfur Dioxide	Light Green w/ Yellow Band	Black
WASTE LINES		
Backwash Waste, RO Concentrate	Light Brown	White
Sludge	Dark Brown	White
Sewer (Sanitary or Other)	Dark Gray	White
OTHER		
Compressed Air	Dark Green	White
Gas	Red	White
Other Lines	Light Gray	White

In situations where two colors do not have sufficient contrast to easily differentiate between them, a six-inch band of contrasting color shall be on one of the pipes at approximately 30 inch intervals. The name of the liquid or gas should also be on the pipe. In all cases, direction arrows shall be applied to the pipe indicating the direction of flow.

- END OF SECTION -

SECTION 099713
STEEL COATINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Surface preparation shall consist of near white blast cleaning in accordance with SSPC-SP 10 in the interior of the tank, and commercial blast cleaning in accordance with SSPC-SP 6 for the exterior of the tank including bracings, catwalks, ladders and other attachments and repairs of all pitting.

1.02 REQUIREMENTS

The Contractor shall furnish all materials, labor, equipment and appliances and shall do all tank surface preparation and field painting as specified herein.

1.03 REFERENCES.0

- A. AWWA D102 (Latest Revisions) Standards.
- B. Kentucky State Board of Health.
- C. U.S. Environmental Protection Agency.
- D. KY Environmental and Public Protection Cabinet.
- E. National Sanitation Foundation (NSF) Standard #61.
- F. ASTM D 16 – Terminology Relating to Paint, Varnish, Lacquer, and Related Products
- G. ASTM D 4263 – Indicating Moisture in Concrete by the Plastic Sheet Method
- H. ASTM F 1869 – Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- I. AWWA C 652 – Disinfection of Water Storage Facilities.
- J. AWWA D 102 – Painting Steel Water Storage Tanks.
- K. SSPC-SP 3 – Power Tool Cleaning.
- L. SSPC-SP 6/NACE 3 – Commercial Blast Cleaning.
- M. SSPC-SP 10/NACE 2 – Near White Metal Blast Cleaning.
- N. SSPC-SP 11 – Power Tool Cleaning to Bare Metal.

- O. SSPC-SP 13/NACE 6 – Surface Preparation of Concrete

1.04 SUBMITTAL

- A. Color chips of finish coatings.
- B. Manufacturer's name and number for each product to be used.
- C. Performance data for substitute products.
- D. Color Selection Charts.
- E. Disinfection Method

1.05 QUALITY CONTROL

- A. The Contractor shall do a complete painting job throughout the work in accordance with these Specifications, the paint manufacturer's current surface preparation and application instructions, and with generally accepted practices for work of high quality.
- B. All paints and painting materials not specifically specified shall be high-grade products of nationally known manufacturers of established good reputation, and shall be suitable for the intended use. Materials listed in the painting schedule without reference to a specification number, or materials not further described hereinafter, shall be products that have had a minimum of two years' satisfactory field service.
- C. All paint shall be applied under favorable conditions by skilled painters to produce smooth even coatings of all interior and exterior surfaces.
- D. Contractor to complete Holiday Detection, for all interior surfaces, in accordance with NACE International RPO188. Three copies of the results, noting any deficiencies, shall be transmitted to the Engineer.
- E. Manufacturer's Qualifications:
 - 1. Specialize in manufacture of coatings with a minimum of 10 years successful experience.
 - 2. Able to demonstrate successful performance on comparable projects.
 - 3. Single Source Responsibility: Coatings and coating application accessories shall be products of a single manufacturer.
- F. Applicator's Qualifications:
 - 1. Experienced in application of specified coatings for a minimum of 5 years on projects of similar size and complexity of this work.
 - 2. Applicator's Personnel: Employ persons trained for application of specified coatings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The paints to be used in the work shall be products of the Tnemec Company Incorporated of North Kansas City, Missouri or an acceptable equivalent product. The types of paint products to be used in the work shall be identified by the manufacturer's name and/or number and brought to the job site in the original sealed containers of the manufacturer. All paints and paint products used on the project shall be from the same manufacturer.
- B. The products of the manufacturers other than those herein named, which are acceptable equivalents to the products specified, may be substituted, except that, insofar as possible, all paints applied to a surface shall be products of one manufacturer. Data showing equivalent performance of each paint product to be substituted for the ones specified shall be submitted in writing to the Engineer for review at least 30 calendar days before the painting is to begin, and no painting shall proceed until the substituted products have been accepted.
- C. All paints and painting materials not particularly specified shall be high-grade products of nationally known manufacturers of established good reputation, and shall be suitable for the intended use. Materials listed in the painting schedule without reference to a specification number, and not further described hereinafter, shall be products that have had a minimum of two years' satisfactory field service.
- D. All paints shall comply with the latest EPA regulations concerning volatile organic compounds (VOC).

2.02 COLORS AND FINISHES

- A. The colors of finish coatings shall be selected by the OWNER from color chips submitted by the Contractor for review. The color selection shall be in the form of a color schedule indicating the colors to be used on the various surfaces. The colors used in the final work shall be in accordance with the color schedule and shall match the selected color chips.
- B. In order to provide contrast between successive coats, each coat shall be of such tint as will distinguish it from preceding coats.

2.03 STORING AND MIXING

All painting materials shall be stored and mixed in a single place. The Contractor shall not use any plumbing fixture or pipe for mixing or for disposal of any refuse material. The Contractor shall carry to his mixing room all water necessary, and shall dump all waste outside of the structure into a suitable receptacle so as not to create hazards or damage. The Contractor will be held responsible for all damage due to his failure to observe these provisions.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. General: Before any surface is painted, it shall be cleaned carefully of all dust, dirt, grease, loose rust, mill scale, old weathered paint unsuitable for top coating, efflorescence, oil, moisture, or other foreign matter and conditions detrimental to coating bond and life. All necessary special preparatory treatment shall then be applied in strict accordance with the paint manufacturer's written instructions. Where required, imperfections and holes in surfaces to be painted shall be filled in an acceptable manner.

- B. Abrasive Blast Cleaning: All interior metal surfaces shall be cleaned by abrasive blasting to near white metal corresponding to SSPC-SP10 "Near White Metal Blasting" prior to applying any paint to the surfaces. All exterior metal surfaces shall be cleaned to a "commercial" finish corresponding to SSPC-SP6 "Commercial Blast Cleaning." A surface profile of 1.5 to 2.5 mils shall be achieved on all abrasive blasted surfaces. Abrasive blasted surfaces shall be painted at the end of each working day and not allowed to remain unpainted until the next working day.
- C. All abrasive blasting work to be conducted on areas not previously abrasive blasted which are adjacent to areas that have previously been blasted and painted shall be done in a manner so that a minimum of six (6) inches of the painted surface is removed and will receive a fresh coat of paint at the same time as the newly blasted surface. This method shall be used for all interior and exterior surfaces.
- D. Coordination: Surface preparation and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- E. All surface preparation work shall comply with all NSF/ANSI Standard 61 and all state and local EPA regulations governing lead based paint removal and the levels of lead and silica to which the public can be exposed.
- F. All internal piping in vaults shall be abrasive blasted to a "commercial" finish corresponding to SSPC-SP6 "Commercial Blast Cleaning."
- G. All surface preparation work shall comply with all state and local EPA regulations governing lead based paint removal and the levels of lead and silica to which the public can be exposed.
- H. All surface areas found to have contamination or loose primer coating, (visible oil, grease or dirt) shall be spot cleaned to remove contaminants or loose coatings- SSPC SP7/NACE No. 4

3.02 APPLICATION

- A. Paint shall be used and applied as recommended by the manufacturer without being extended or modified, and with particular attention to the correct preparation and condition of surfaces to be painted.
- B. Surfaces which have been cleaned, pretreated, or otherwise prepared for painting shall be painted with the first field coat as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.
- C. Unless otherwise specified, stainless steel surfaces throughout the work shall not be painted.
- D. Hardware accessories, machine surfaces, plates, lighting fixtures, and similar items in place prior to surface preparation and painting, and not intended to be painted, shall be removed during painting operations and repositioned upon completion of each area or shall otherwise be protected.
- E. Paints or other finish shall not be applied to wet or damp surfaces, or when the relative humidity exceeds 80% except in accordance with the instructions of the manufacturer. Exterior painting shall not be done during cold, rainy, or frosty weather, or when ambient temperature or painting surface temperature is likely to drop to 40 degrees F. Painting shall not be done unless the painting surface temperature is at least 5 degrees F above the dew point. Temperature requirements of paint manufacturer are to be observed when minimum

is greater than 40 degrees F. Painting of surfaces while they are exposed to the sun shall be avoided.

- F. All paint shall be applied under favorable conditions by skilled painters and shall be brushed or rolled out carefully to a smooth, even coating without runs or sags. Each coat of paint shall be allowed to dry thoroughly, not only on the surface but throughout the thickness of the paint film before the next coat is applied.
- G. Finish surfaces shall be uniform in finish and color, and free from flash spots and brush marks. In all cases, the paint film produced shall be satisfactory in all respects to the Engineer.
- H. Spraying with adequate apparatus may be substituted for brush application of those paints and in those locations for which spraying is suitable.
- I. The Contractor shall not only protect his work at all times, but shall also protect all adjacent work and materials. Upon completion of the work, he shall clean up all paint spots, oil, and stains from floors, glass, hardware, and similar finished items.
- J. Shop priming of the water storage tank shall be allowed by the Contractor. The preparation of all metal surfaces prior to applying any paint shall be conducted in accordance with the specification herein.
- K. If the tank is shop primed, the Contractor shall pay for all costs and expenses for the Engineer to inspect the tank while being shop primed. Once the tank has been erected in the field, all welds, scratches, and other areas which were damaged during erection of the tank shall be abrasive blasted and primed by roller or brush application as per the specification herein.

3.03 RATES OF APPLICATION

- A. Paint shall be applied so as to obtain the coverage per gallon and the dry film thickness recommended by the manufacturer or as specified herein. The Contractor shall record, in a manner satisfactory to the Engineer, the quantities of paint used for successive coats on the various parts of the work.
- B. If paints are thinned for spraying, the film thickness after application shall be of the same as for un-thinned paint applied by brush. Thinning of paint for spraying shall be in accordance with the paint manufacturer's recommendations. Deficiencies in film thickness shall be corrected by the application of another coat of paint. Excessive application rates will not be allowed. The Contractor shall submit to the Engineer, immediately upon completion of the job, certification from the paint manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces. Such certification shall make reference to the square footage figures provided to the manufacturer and the Engineer by the Contractor.
- C. The paint applicator shall have available on the project site a paint film thickness measuring device capable of measuring 0-59 mils with accuracy of $\pm 2\% + 0.1$ mil, operating temperature range 5 degrees C to 50 degrees C and meet ASTM B499 and ISO 2178 specifications. Reference SSPC-PA2 as to how thickness readings should be taken.

3.04 PAINT TYPES AND SCHEDULE

The following types of paints shall be used throughout the work on items and surfaces indicated. All paints and painting schedules shall be in accordance with AWWA D102 (latest revisions).

A. External Painting: The Contractor shall furnish all materials and labor to paint the external surface of the tank, center riser, support legs, bracing, catwalk, ladder, and any and all exterior metal surfaces on or related to the tank. There shall be no paint applied until the abrasive blasting is complete and approved by the Owner prior to applying new paint. The painting shall conform to the following:

1. Shop Prime Coat: Apply one coat of Tnemec Series 90-97 Tnemec Zinc to a minimum of 2.5 to 3.5 mils dry thickness.
2. Field Patch and Spot Prime: Apply one coat of Tnemec Series 90-97 Tnemec Zinc to a minimum of 2.5 to 3.5 mils dry thickness.
3. Field Intermediate Coat: Apply one coat of Tnemec Series N69 Epoxoline to a minimum of 3.0 to 5.0 mils dry thickness.
4. Field Finish Coat: Apply one coat of Tnemec Series 74U Endurashield to a minimum of 2.0 to 3.0 mils dry thickness. The field finish coat shall contain a polyurethane clear coat for added protection.

NOTE: THE EXTERIOR NEW COATING SYSTEM APPLIED SHALL HAVE A MINIMUM DRY FILM THICKNESS OF 10.0 DRY MILS.

B. Interior Painting: The Contractor shall furnish all materials and labor to paint the interior of the tank and center riser with a 3 coat epoxy system. There shall be no paint applied until the abrasive blasting is complete and approved by the Owner prior to applying new paint. The painting shall conform to the following:

1. Shop Prime Coat: Apply one coat of Tnemec Series 91 H20 Hydro-Zinc 2000, Sherwin Williams Corothane I Galvapac Zinc, or approved equal, at a dry film thickness rate of 3.0 mils. Maximum coverage rates shall not exceed manufacturer's recommendations. Drying time shall be as indicated on the manufacture's product data sheets.
2. Field Patch and Spot Prime: Apply one coat of Tnemec Series 91 H20 or, Sherwin Williams Corothane I Galvapac Zinc, or approved equal, at a dry film thickness rate of 3.0 mils. Maximum coverage rates shall not exceed manufacturer's recommendations. Drying time shall be as indicated on the manufacture's product data sheets.
3. Intermediate Coat: Apply one full coat of Tnemec Series 20HS-1255 beige Pota-Pox or Sherwin Williams Macropoxy 5500 or 646PW or approved equal at a dry film thickness rate of 4.0-6.0 mils.
4. Field Finish Coat: Apply one coat of Tnemec Series 20 HS-1255 tank white Pota-Pox or Sherman-Williams Macropoxy 5500 or 646PW, or approved equal, at a dry film thickness rate of 4.0-6.0 mils. Maximum coverage rates shall not exceed manufacture's recommendations.

NOTE: THE COMBINED COATS SHALL HAVE A MINIMUM DRY THICKNESS OF 12.0 MILS.

NOTE: AS SPECIFIED ABOVE, MINIMUM DFT IS 12.0 MILS. SPOT PRIMING IS MEANT ONLY TO REPAIR DAMAGED AREAS.

C. Internal Piping: The Contractor shall furnish all materials and labor to paint the piping in the valve vaults. There shall be no paint applied until the abrasive blasting is complete and

approved by the Owner prior to applying new paint. The painting shall conform to the following:

1. First Finish Coat: Apply one coat of Tnemec Series N140- 15BL Potapox Plus (mixed 1 to 1, by volume), Sherwin-Williams Macropoxy 646 / 846 NSF, Carboline Carboguard 890, or Induron PE 54 to a minimum of 4.0 to 5.0 mils dry thickness.
2. Final Finish Coat: Apply one coat of Tnemec Series 140-11WH Potapox Plus (mixed 1 to 1, by volume), Sherwin-Williams Macropoxy 646 / 846 NSF, Carboline Carboguard 890, or Induron PE 54 to a minimum of 4.0 to 5.0 mils dry thickness.

NOTE: THE COMBINED COATS SHALL HAVE A MINIMUM DRY THICKNESS OF 8.0 MILS.

3.05 CURING FOR INTERIOR PAINTED SURFACE

- A. Drying Schedule @ 30.0 mils wet @ 73° F and 50% relative humidity:

To touch 1 Hour
 To recoat
 minimum..... 2 Hours
 maximum..... 18 hours

Immersion (water) 12 hours
 To cure 24 hours

- B. Rinse potable water tanks with fresh water before filling to remove any traces of solvent thus assuring coating will not impart taste, odor or color.

3.06 STERILIZATION

- A. Disinfection and sterilization of the interior of the towers shall not take place until the interior paint has sufficiently cured.
- B. The Contractor shall sterilize the tower in accordance with AWWA C652, (latest revision) "Disinfection of Water Storage Facilities" and Kentucky Regulations 401 KAR 8. The Contractor shall declare which Disinfection Method will be utilized with Engineer and Owner approval.
- C. The Owner reserves the right to delay testing and sterilization until the water is adequate for such major usage.
- D. The towers may be sterilized during preloading provided that no leaks are found which would require re-work and re-sterilization. Otherwise the spray method of sterilization will be required.
- E. Disinfection may be conducted by use of chlorine or chlorine compounds in such amounts as to produce a concentration as described in AWWA C652 (latest revision) for the approved disinfection method.
- F. Bacteriological testing of the water shall be conducted by the State Department of Health. The towers shall not be placed in service until the sample is approved by the Health Department. All results are to be mailed to the Engineer. All costs of sampling, testing, and postage shall be borne by the Contractor.

3.07 GAURANTY

The Contractor, in signing his proposal, guarantees to repair any and all defects due to workmanship, i.e. sags, drips, cracks, separation or unsuitable material which appear in the structures or coating system during the period of three years after the date of acceptance.

3.08 CLEANUP

All construction material and debris shall be removed from the site upon completion of work.

3.09 SIGNAGE

Contractor shall provide signage on the side of tank. The signage shall read "ALLEN COUNTY WATER DISTRICT". Shop drawings shall be provided to the engineer showing the lettering and sizing of the letters as proportional to the tank. A color chart shall also be provided with the shop drawing submittals for the owner to choose the tank and letter colors. The location of the signage will be determined in the field by the owner and the engineer's representative.

- END OF SECTION -

DIVISION 15
MECHANICAL



SECTION 15000

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

The work in this section shall include all labor, materials, equipment and services required to construct and install the complete and operable mechanical systems. The omission of express reference to a complete installation shall not be construed as releasing the Contractor from providing such parts or work as may be required.

1.02 REFERENCES

The chemical and physical properties of all materials and the design, performance characteristics and methods of construction of all items of equipment shall be in accordance with the requirements of the latest issue of the various applicable Standard Specifications. These Standard Specifications have been prepared by authorities which are recognized by the Mechanical Trades. The names of these authorities are listed below together with the abbreviation of their names as they may appear in these Specifications.

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. National Fire Protection Association (NFPA)
- D. Air Movement and Control Association (AMCA)
- E. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
- F. American Society of Mechanical Engineers (ASME)
- G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

1.03 PERMITS AND INSPECTIONS

- A. Contractor shall obtain all permits and inspections necessary for completion of work under this division and pay all legally authorized fees.
- B. Contractor shall furnish three copies of all required inspection certificates before requesting final payment.

1.04 CODE COMPLIANCE

- A. Contractor shall complete all work in accordance with applicable State and Local regulations including but not limited to the following:

- City, State and County Building Inspector
- National and Local Electrical Codes
- National Fire Protection Association
- State Department of Health
- State Plumbing Code
- Air Pollution Board

Kentucky Standards of Safety
Local Insuring Agency
National Sanitation Foundation

B. Systems, equipment and materials furnished or provided by this Contractor shall be in accordance with applicable State and Local regulations.

C. Systems, equipment or materials furnished or provided by this Contractor shall not be considered substantially complete if work is not in accordance with State and Local regulations.

1.05 EXAMINATION OF SITE

A. Contractor shall visit the site and acquaint himself with the working conditions. Contractor shall accept conditions as they exist on bid date. Claims for labor and material required for difficulties encountered, which could have been foreseen had an examination been made, will not be recognized.

B. Contractor shall notify the Architect/Engineer immediately of any existing field conditions not compensated for in the contract drawings and/or specifications. Any work not shown on Contract Drawings which is performed without proper authorization shall make Contractor responsible for correction, addition, and/or deletion as may be later called for by the Architect/Engineer.

1.06 SUBMITTALS

A. General shop drawing submittals will be required for all plumbing fixtures and mechanical equipment as specified in the following specification sections.

B. All shop drawings shall be checked and noted accordingly by the Contractor before submitting same to the Engineer for his review.

C. No equipment shall be ordered or fabricated without formal approval of submitted shop drawings.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products shall be as specified in Division 15 and in the following sections of these Specifications for specific mechanical products used in the Work.

B. Products containing asbestos shall NOT be used.

PART 3 - EXECUTION

3.01 CONSTRUCTION SAFETY

This Contractor assumes responsibility for the safety of his personnel. The Contract Documents do not include materials, procedures, components, etc., required to insure construction safety. Refer to the General Conditions and Supplementary General Conditions for additional information.

3.02 ASBESTOS

This Contractor shall instruct all personnel, including those of any sub-contractors, that should any material suspected of containing asbestos be observed that all work shall stop immediately and all personnel shall vacate the premises. This Contractor shall then notify the Architect/Engineer and await further

instructions. This Contractor assumes all liability for failure to notify personnel of potential hazards and procedures.

3.03 CONTRACT DRAWINGS

A. Scale of drawings is approximate. Exact locations, dimensions, and elevations shall be governed by field conditions. Make field measurements of building before fabricating equipment or materials.

B. Drawings are based on physical dimensions of one or more manufacturer's equipment. Other approved equipment shall be of such dimensions that it can be readily installed in available space with ample clearance for proper maintenance and operation.

C. Intent of drawings is to show systems and sizes. Drawings do not necessarily show all required offsets. Work shall be installed to conform with space limitations. Offset, transformation, fittings, etc. shall be provided where required to attain this objective.

D. Refer to other drawings for construction of building, work in other sections and floor and ceiling elevations.

E. Failure to notify the Architect/Engineer inconsistencies in the Contract Documents shall make the Contractor subject to either method as may be later called for the Architect/Engineer.

3.04 ORDER OF WORK

Contractor shall organize work to cause least disturbance possible to operation of any building, service or system on site. When necessary to interrupt services, time of interruption shall be approved by Owner. Extras for differences between regular and overtime pay shall be allowed only when work is authorized to be accomplished at a time other than regular working hours. Work shall be scheduled to coincide with and cause the least possible disturbances to other Contractor's work and schedules.

3.05 COOPERATION

A. Cooperate with other trades to obtain the most practical arrangement of work. Become familiar with drawings before starting work.

B. Make known to other trades intended positioning of materials and intended order of work. Coordinate work with other trades and proceed with the installation to assure no delays to other trades. Determine intended positions of work of other trades and intended order of installation.

3.06 WORKMANSHIP

Work shall be performed only by mechanics and tradesmen skilled and working within their respective trades and shall present appearance typical of the best trade practices. Work not installed in this manner shall be repaired, removed or replaced, or otherwise remedied at Contractor's expense as directed by Architect/Engineer.

3.07 GUARANTEE

A. Labor and materials entering into this contract shall be guaranteed for a period of one year from date of acceptance. Date of acceptance shall be date of voucher for final payment. Owner reserves right to use equipment installed prior to date of final acceptance. Use of equipment by Owner shall in no way invalidate guarantee except Owner shall be liable for damage to equipment during this period due to negligence of his operator or other employees.

B. This guarantee shall further provide that in the event of a failure of any system or its component equipment items or the improper functioning thereof, during the period of this guarantee. This

Contractor shall have available an "on call" competent service personnel for the restoration of all systems and equipment for complete operation. Should the nature of the failure be such as to present an emergency in the opinion of the Owner, such personnel shall be promptly available, regardless of the hour of the day or day of the week. Should the failure be such as to fall under the guarantee, the cost of the service shall be borne by this Contractor, otherwise the Owner will pay therefor at the prevailing rate for such service.

C. Should this Contractor fail to make such service personnel promptly available "on call" the Owner may employ such personnel as are available to him at the expense of this Contractor.

3.08 MANUFACTURER'S INSTALLATION INSTRUCTIONS

All equipment shall be installed in strict accordance with the manufacturer's installation instructions.

3.09 PROTECTION OF EQUIPMENT AND MATERIALS

This Contractor shall continuously maintain adequate protection of all equipment and materials. Equipment and materials, located inside or outside, shall be tightly covered with sheet polyethylene or waterproof tarpaulin as protection against dirt, rust, moisture and abuse from other trades. Equipment and materials shall not be stored directly on the ground. Equipment, ductwork and piping shall not be used as supports for scaffolds or personnel. Repairs made necessary by damage shall be paid for by this Contractor.

3.10 CUTTING AND PATCHING

A. Unless otherwise indicated do all cutting and patching required for installation of work. All openings not requiring lintels shall be cut and patched by mechanical contractor. Openings requiring lintels for ductwork, grilles, louvers, etc. in vertical walls both new and existing shall be provided by this Contractor. Patching of these openings shall be by this Contractor.

B. Do no more cutting than necessary. Cutting of structural members or exposed surface of concrete block shall not be permitted without written approval of Engineer.

C. Cut pipe openings in floor slabs with core drill. Scribe cut edges of trenches or openings in slabs with masonry saws.

D. Where necessary to remove exterior walks, paving, or lawns, they shall be returned to their original surfaces.

E. Only skilled mechanics and tradesmen shall do patching and finishing required to match surrounding surfaces.

3.11 PAINTING

A. All painting except "touch-up" shall be provided under the painting section (Division 9) unless noted otherwise. All exposed piping, equipment, etc., shall be left clean and free from rust or grease and ready for the painter.

B. Where equipment finishes are damaged, this Contractor shall obtain touch-up paint in matching colors from the equipment manufacturer and paint as required.

3.12 LUBRICATION

This Contractor shall provide all lubricants for the operation of all equipment until acceptance. The Contractor shall protect all bearings during installation of equipment and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. All equipment bearings requiring frequent or periodic lubrication shall

be provided with proper fittings for this purpose. Where equipment requiring such lubrication is not readily accessible due to position or location, extensions shall be provided in addition to lubrication fittings.

3.13 EQUIPMENT CONNECTIONS

A. This Contractor shall bring all required mechanical services to all equipment furnished under other sections of this Specification or by the Owner, make final connection, and leave equipment ready for operation.

B. When the Contractor is uncertain about the method of installation, proper location, etc., he shall ask for further instructions or details. Failure to request such information will not excuse non-compliance.

3.14 TESTS

This Contractor shall conduct all specified tests until approved by the Engineer. All tests shall be repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests have been made and approvals obtained. This Contractor shall notify the Architect four days prior to testing to allow for scheduling. Tests shall be conducted as specified in applicable sections.

3.15 CLEAN-UP

A. Before final acceptance of work, clean and restore all road surfaces, sidewalks, and other areas leaving them in a neat, clean and usable condition as originally found. Remove all machinery, tools, surplus materials, dirt, sand, temporary building, and other structure from the site. All manholes and other appurtenant structures shall be cleared of all scaffolding, rubbish and dirt. Existing road and walks cut or damaged shall be restored and repaired to the satisfaction of the Architect/Engineer.

B. Equipment, fixtures, diffusers, grilles and exposed piping and supports shall be cleaned to the satisfaction of the Architect/Engineer before the project can be considered Substantially Complete.

3.16 AS-BUILT DRAWINGS

The Contractor will furnish one (1) set of prints which will be on file in the field office. These prints shall be kept and maintained in good condition at the site of the project and a qualified representative of the Contractor shall record on these prints from day to day as the work progresses, all changes, alterations and deviations from the contract drawings with special emphasis on the exact final location of all underground utilities by offset distances to surface improvements such as building corners, curbs, etc. Entries and notations shall be neat, legible and permanent. Those prints shall be delivered to the Architect/Engineer upon completion of the project. Approval of final payment will be contingent upon compliance with these provisions.

3.17 OPERATING AND MAINTENANCE MANUALS

Provide four (4) copies of operating and maintenance manuals. Manuals shall be bound in large ring loose-leaf binders and contain the following:

- A. Manufacturer's instructions and/or installation manual.
- B. Manufacturer's service manual.
- C. Manufacturer's lubrication chart listing types of lubricant to be used on each item of equipment and recommended frequency of lubrication.
- D. Electrical diagrams of each equipment "packaged" control system.

E. Diagrams of automatic temperature control systems, identifying each by name, location and number showing sequence of operation. Each component of a control system shall be identified by model number, location, description of component, function, pressure or temperature range, voltage, special accessories, etc., or technical information necessary to fully describe the component. All diagrams shall be up-to-date, reflecting any on-the-job changes.

F. Part lists and identifying part numbers with prices of each part. The name and address of the nearest distributor from which parts can be obtained.

3.18 OPERATING INSTRUCTIONS

A. Contractor shall organize and conduct a training session at the site to instruct the Owner in the proper operation of all systems.

B. The Owner's operating personnel shall be instructed by the Contractor on how to start and operate each item of equipment.

- END OF SECTION -

SECTION 15230

FACTORY-BUILT BOOSTER PUMP STATION

PART 1: GENERAL REQUIREMENTS

SCOPE OF WORK

The contractor shall furnish and install one (1) - factory built, factory delivered, above-ground water booster pump station, in a modular building with base frame on a structural base with all necessary internal piping, valves, fittings, supports, meters, control valves, pumps, motors, controls, automatic transfer switch (not by station manufacturer) and other necessary appurtenances as shown on the plans and specified herein.

The station shall be complete when delivered and will not require internal contractor construction except to install the power service through the service conduit provided for that purpose and to connect the main water service to the required points and other work as may be listed in the Section for CONTRACTORS INSTALLATION REQUIREMENTS.

CONTRACTOR INSTALLATION REQUIREMENTS

The contractor shall be required to provide a crane **and spreader bars** to set the station on the foundation designed by the engineer shown in the plan set. The foundation shall be built by the contractor and as directed by the engineer. Following setting of the station, the contractor will be required to anchor the station to the foundation. The contractor shall supply the anchor bolts.

CONTRACTORS RECOGNITION OF A VALID EQUIPMENT PROPOSAL

To avoid a displacing of responsibility, the Pumping Station manufacturer alone shall propose to contractors on the assembled equipment covered by this section of these contract documents. Said manufacturer's proposal must be signed by an officer of the manufacturing company.

Bidding Contractors will be instructed NOT to accept or base their bid on equipment proposals from a representative, third party agent or intermediary.

The Contractors shall provide electronically to the Engineer of Record an un-priced Equipment Proposals from any proposing manufacturers, doing so to ensure those proposals are direct from and signed by each proposing manufacturer.

MANUFACTURER'S RESPONSIBILITY FOR PERFORMANCE

The Specifications and Drawings for the Factory-built equipment do not necessarily include all the details for the design and fabrication for the factory-built equipment. The Drawings are generally schematic but the specifications do call out strict requirements to known methods, components and assemblies that must be in a full, complete and functional pumping station. As such, the Manufacturer shall accept and hold complete responsibility for the functionality of the pump station and its workings.

BASIS OF DESIGN MANUFACTURER

The BASIS OF DESIGN station equipment is by Engineered Fluid, Inc. having been deemed to represent the minimum level of quality, performance and service acceptable for this equipment. Engineered Fluid, Inc. is represented by Mr. Brian Gatewood of JAGS Environmental, telephone (859) 609-1539.

ALTERNATE MANUFACTURERS

Alternate manufacturers may propose on the equipment set forth in these documents provided these

alternate manufacturers take no exceptions to the contract documents and these manufacturers provide the PRE-BID SUBMITTAL information so listed in this specification.

Alternate manufacturers are eligible to provide contractor proposals for this equipment. However, these listed manufacturers must have provided a PRE-BID SUBMITTAL to the Engineer of Record at least ten (10) days prior to the bid date.

PRE-BID SUBMITTAL DOCUMENTS

Along with the requirements for post bid submittal documents provided for elsewhere in these documents, all alternate manufacturers offering equipment proposals, without exception, for this equipment shall provide at least ten (10) days before the bid date the below-listed PRE-BID SUBMITTAL documents for the pump station and containing at a minimum:

1. "D" sized only, station mechanical drawing sheets fully to scale and fully annotated showing;
 - a. A PLAN VIEW of all mechanical equipment, piping and devices necessary to system operation and with NEC Electrical Clearances;
 - b. A lengthwise SECTION VIEW;
 - c. A Sidewise SECTION VIEW;
 - d. A complete STRUCTURAL PLAN VIEW of the steel base for the pump stations.
2. "D" sized only sheets showing;
 - a. A POWER ONE LINE DIAGRAM annotated and showing all power components;
 - b. A PROCESS & INSTRUMENTATION DIAGRAM (P&ID) showing all components, devices and circuit for the controls and instrumentation for the control and monitoring equipment including the PLC equipment.
3. A detailed drawing of the buildings to be used to house the station(s) including anchoring and assembly methods.
4. An affidavit signed by an officer of the station manufacturer attesting to the fact that the building and building manufacture intended for use on this project has in the past obtained State of Kentucky Certification for the exact building to be provided.

PRE-BID SUBMITTAL documents will not be accepted after the date set so it is the Bidding Contractors responsibility to determine which of the listed manufacturers have turned in their PRE-BID SUBMITTAL documents.

The Engineer of Record shall review the PRE-BID SUBMITTALS for adherence to the contract documents.

The PRE-BID SUBMITTAL shall be provided in One (1) hard paper copy bound in a three ring binder with a Table of Contents and tabs for each individual pump station and with One (1) electronic copy on CD placed inside the three ring binder in a suitable pocket.

The manufacturers that are approved for proposing on the specified equipment, the approval of their PRE-BID SUBMITTAL in no way excuses them from providing a full set of submittal documents being in full conformance to the contract documents for detailed review by the Engineer post bid.

POST BID SUBMITTAL

Equipment submittals shall be bound and in a minimum of two (2) electronic copies on CD and or USB Flash Drive. The submittals shall contain a minimum of two (2) full size drawings, size 24" x 36"; one (1) each covering the booster pump station and the electrical control schematic. The booster pump station drawing shall be specific to this project, in at least three (3) different views, be to scale and illustrate the National Electrical Code (NEC) clearances per Section 110-26 of the Code. The submittal documents will be complete with data sheets covering all major components that make up the booster pump station and the UL/ETL file number

under which the manufacturer is listed, service department personnel statement as detailed in the specifications and be complete with the manufacturer's formal warranty policy.

Two (2) submittal reviews of this item will be accomplished at no cost to the submitting contractor. However, all subsequent reviews will be charged to the submitting contractor at the design engineer's standard hourly billing rate.

QUALITY ASSURANCE

The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated per manufacturer's recommendations.

THIRD PARTY INSPECTION LISTING (STATIONS 600V MAX.)

The station manufacturer shall be required to affix to the station an UNDERWRITERS LABORATORIES (UL) LABEL attesting to the compliance of the station equipment under the PACKAGED PUMPING SYSTEMS (QCZJ) UL Listing Category and/or INTERTEK TESTING SERVICES (ETL) LABEL attesting to the compliance of the station equipment under PACKAGED PUMPING SYSTEMS. The ETL label shall state the station conforms to UL STD 778 and is certified to CAN/CSA STD C22.2 NO. 108.

SHIPPING AND DELIVERY

The specified equipment shall be delivered by the manufacturer FOB DESTINATION and thereby the station manufacturer shall hold the full responsibility for the condition and completeness of the equipment upon its delivery.

If the manufacturer ships the pump station to the jobsite using a contract carrier, the manufacturer shall provide to the Contractor and to the Engineer of Record an insurance policy specifically covering the shipment of the station to the jobsite, said policy to ensure the station to be free of damage or adverse effects of the transportation. The face value of the policy shall be the sale value of the pump station

The Engineer shall hold the right to inspect the equipment prior to unloading and setting so as to assure the quality and condition of the equipment is in no way deficient.

If in the view of the Engineer or Engineer's inspector, the equipment is deficient when delivered, delivery shall be refused.

SPECIFIED COMPONENTS

Within the body of this specification and on the drawings, certain components are listed by name and/or model number for at least One (1) manufacturer's specific product. As such, no "OR EQUAL" is listed or allowed where at least the one manufacturer is listed.

These listed components have been chosen because of the Engineer's and Owner's knowledge of and experience with these listed components.

No other components other than those listed are acceptable.

FACTORY START-UP AND TRAINING SERVICE

Without exception, the station manufacturer is directly responsible for station start-up and operator training. Third party contractors, agents or representatives are not to be allowed to start up the station nor the equipment therein. As such;

1. Start-up Factory Service Technician shall be a regular employee of the station manufacturer.

2. The booster pumping system manufacturer and controls integrator shall provide two (2) electronic O & M's in pdf format containing as built final system drawings, I/O listings, wiring diagrams, and operating and maintenance information. The submitted manuals shall be sufficient to facilitate the operation, removal, installation, programming, and configuration, adjustment, calibration, testing and maintenance of each and all components and instruments. Final software listings of the operational ladder logic shall be provided herewith.

MANUFACTURER'S WARRANTY

The warranty is the sole responsibility of the station manufacturer and that manufacturer's warranty shall be provided in written form, being placed in both the Submittal documents covering the specified equipment and the O&M manuals provided with that equipment.

It is required the station warranty provide the Owner with a single source responsibility for all components specified herein and the system as a whole. That single source shall be none other than the station manufacturer. Third party suppliers, service contractors, "Pass-through" warranties and service by the representative are not acceptable.

Said manufacturer's warranty shall at a minimum cover:

1. A period of one (1) year commencing upon successful start-up, after authorized manufacturer's start-up, not to exceed eighteen (18) months from the date of shipment.
2. The warranty period shall be inviolate regardless of any component manufacturer's warranty for equipment and components within the station.
3. The manufacturer's warranty shall cover all equipment, components and systems provided in or with the station by the manufacturer of the station, exclusive of those components supplied by and/or installed by others independent of the manufacturer of record for this station.
4. The warranty shall provide for the station manufacturer to bear the full cost of labor and materials for replacement and/or repair of faulty or defective components so there shall be no cost incurred by the Owner for this work during the warranty period.
5. The manufacturer's warranty policy is amended only by the items considered consumable, i.e., light bulbs, pump seals, pump packing, lubricants and other maintenance items consumed by usage.
6. No assumption of contingent liabilities for any component failure during manufacturer's warranty is made.
7. The warranty pertains only where the equipment has been operated in strict accordance with the manufacturer's instructions and requirements. Evidence of misuse or modification to the equipment voids the warranty.

If the submitted written manufacturer's warranty does not meet the minimum requirements set forth above, that submittal will forthrightly be rejected.

GENERAL LIABILITY INSURANCE

The water distribution station manufacturer shall furnish premises/operations and products/completed operations general liability insurance from an insurance company with a rating of A-V according to the most recent Best's Key Rating Guide, in an amount equal to \$1,000,000 per occurrence and up to \$11,000,000 total with Umbrella.

The insurance certificate must be included with the manufacturer's submittal. The coverage must be

provided by an insurance carrier licensed and admitted in the state of manufacture.

PART 2: PRODUCTS AND COMPONENTS

ON-GRADE EQUIPMENT BUILDING

BUILDING DESIGN CRITERIA

The station building enclosure shall be a factory assembled, modular structure of one (1) compartment all attached to the station base structure and requiring no additional assembly at the job site.

The building design criteria shall be: (1.) To withstand snow load based on ASCE 7-10 Ground Snow Loads for the state and county of installation (2.) To withstand wind loads based on ASCE 7-10 for wind speeds; (3.) Be designed for site specific seismic requirements based on local conditions as dictated by the Available Ground Motion Parameters according to ASCE 7 and IBC established by zip code and a live floor load of 125 PSF; (4) Be designed to IECC 2015 version of the energy code.

The modular building enclosing each of the stations is shown at its minimum size so that National Standards mandated clearances are maintained above, below and around equipment for proper and safe servicing, removal and reinstallation of this equipment.

The building specified shall be of the size shown on the drawings. Building sizes less than those shown will not be allowed.

STATE OF KENTUCKY

By Kentucky Commonwealth Law, all Modular Buildings Manufactured in or imported into the state must have Model Plan Approval by the Kentucky Office of Housing, Buildings & Construction (State Fire Marshal) as administered by the Kentucky Industrialized Building System (K.I.B.S.) Program. An authorized Manufacturer will have an assigned KIBS Factory Number, and each unit will bear a serialized label certifying it is "In Compliance with the Standards Adopted by the Authority of the 2002 Kentucky Residential Code or the 2018 Kentucky Building Code". The pump station Manufacturer will be required to provide the assigned KIBS Factory Number, and the Serial Number for each label which will be attached to the Modular Station. Stations lacking this serialized label at time of delivery will not be accepted.

BUILDING CONSTRUCTION

The materials specified are specifically chosen to be resistant to moisture degradation and infestation and to be maintainable.

Insulation values for the walls and roof structure shall be a minimum R-21 in the walls and the roof. Insulation within the roof and wall panels shall be foam-in-place polyurethane material applied between the interior and exterior sheathing forming a closed cell bounded by the steel framing. The insulation shall have a minimum density of 2.0 lbs/cu. ft. nominal and shall be applied to the thickness required to provide a minimum R value of 21. The insulation shall have an ASTM E-84 flame spread Class 1 < 25 and smoke development Class 1 < 450.

Building framing materials shall comply with the A.I.S.I. Specification for the Design of Cold-formed Steel Structural Members and to Standards ASTM C-955, ASTM C-1007, ASTM C-645, ASTM C-754 and ICBO 4782P. and 4784P. A framing design incorporating the members covered by the listed specifications and standards shall develop a structure meeting or exceeding the building design criteria listed previously.

Metal-clad, foam insulated panels or SIPS will not be allowed.

The building structure shall be fabricated using steel C-studs as wall framing members and C-joists for roof support. The size, placement and spacing of studs and joists shall be in accordance with the design criteria

and material standards. The wall C-studs shall be a minimum 2" x 3 5/8 of 16 gauge material minimum. The roof C-joists shall be a minimum 1-5/8" x 8" size of 16 gauge material minimum.

The exterior wall sheathing shall be 1" thick, 15 psi polystyrene foam board insulation with an R-5 insulative value.

The exterior roof sheathing shall be 5/8" thick, exterior, CDX grade plywood.

The interior wall and ceiling sheathing shall be 3/4" thick, exterior, CDX grade plywood.

All interior wall & ceiling surfaces shall be covered with .090" thick FRP (fiberglass reinforced plastic) sheeting of pebble grain, gloss, white finish. The individual wall faces shall be covered with one continuous sheet. The FRP sheets shall be glued to the sheathing requiring no fasteners. Corner moldings of like FRP material shall be installed & finished in a workmanlike manner.

Openings in the sidewalls and/or roof shall be as shown and be fully framed out and supported using single or multiple framing members sufficient to support and fasten those devices or equipment items requiring a framed opening, these being access hatches, HVAC equipment, pipe passages, conduit passages, door and window openings and other special purpose openings as might be shown and required. The attaching of devices or equipment to the building at a framed opening shall be done fully according to the device manufacturers mounting instructions.

The building shall be warranted by the station manufacturer for a period of ten (10) years from the date of delivery.

HEAVY DUTY STEEL DOORS

Doors, single and double leaf and of the size shown, are manufactured of 18-gauge galvanealed steel. All doors shall be full flush construction and 1-3/4 inches thick. Doors shall be reinforced, stiffened, insulated, and sound deadened with a solid polystyrene foam board permanently bonded to the inside of each face skin. The lock and hinge edge of each door shall be welded with a center hairline seam the full height of the door. The lock edge shall be reinforced full height by a 14-gauge continuous one-piece channel extruded templating. The hinge edge shall be reinforced full height by a 14-gauge continuous one-piece channel, formed and tapped for hinges. Top and bottom of the door shall be closed with 16-gauge channels. Doors shall be thoroughly cleaned and receive an iron phosphate treatment prior to receiving one coat of prime paint. Door closures and rim panics are reinforced with 14-gauge channels.

Doors shall be fully-mounted in frames produced for pre-hanging of commercial 1-3/4" doors. Frames are formed to 16-gauge commercial quality cold rolled steel conforming to ASTM A366 or A620 and A568. Frames are produced in two welded units, to be mechanically joined during installation. The base side is prepared for all required hardware. Both units, base and trim, are furnished with welded mitered faces. Frame anchoring includes compression anchors and stud screws. Door hinges shall be continuous gear hinges, fabricated of extruded 6063-T6 aluminum alloy/temper with pinless assembly. The doors shall have a lockset, exterior handle, and top mounted-door closer with hold-open device.

Doors and frames shall be finished with a two-component, aliphatic/acrylic polyurethane coating, white in color, with a high gloss finish. The coating shall be resistant to a wide range of solvents and chemicals under splash and spill conditions. The coating system is V.O.C. compliant.

Door sizes and locations are as shown on the drawings.

MOUNTING AND FASTENING

The building shall be fabricated up from and securely attached to a framework fabricated of 2" x 6" steel tubing welded at each corner to form a base frame serving as a stable base for handling and transporting the building prior to attaching the building to the station base skid. To hold the building framing to the 2" x 6"

base frame, 5/8" anchor studs will be welded to the base frame. In assembling the building framing to the base frame a 3 1/4" x 4" x 1/4" thick anchor plate under a flat washer, lock washer and 5/8" nut shall be used to fasten the building framing to the framing base as shown. The base frame shall be grit blasted to a SP-6 finish and coated with the specified coating material.

The building enclosure shall be firmly and securely attached to the steel base structure by lag bolting from inside the station, through evenly spaced 9/32" holes pre-drilled into a 2" by 1-1/2" by 1/8" thick angle piece that has been continuously welded to the steel floor. The lag bolts shall screw into the 2" x 6" tubular base frame upon which the building has been built.

The lag bolts shall be plated steel, size 5/16" diameter x 2" long. The number and location of the lag bolts shall be as determined by structural analysis so as to maintain the live load and wind load ratings as specified and to resist shearing and tearing in the process of transporting and placing the finished station.

EXTERIOR TREATMENT-SIDE LAP, RIBBED METAL SIDING

The exterior sheathing shall be covered with 29 gauge metal siding. The siding shall have a trapezoidal rib on 9" centers. Each panel shall be of the exposed fastener, sidelap seam type and have a rib height of 7/16 inches and be 36" wide with a smooth texture. The steel siding shall be warranted for twenty years and shall be Max-Rib as manufactured by McElroy Metal.

METAL ROOF SYSTEM

The roof sheathing shall be covered with a 26 gauge metal panel system to form a standing seam roof as shown. The panels shall have a Galvalume® substrate with a Kynar 500® finish. The panels shall meet UL Standard 2218, Class 4 impact resistant and Class A fire resistant rating. The system shall be complete with fascia and soffit. The minimum roof slope shall be 3:12.

The ridgeline of the roof shall be covered end to end with a broken edge panel open along the sides to create a roof vent along both sides of the entire ridge line. The top of the broken edge panel along the ridge line shall cover over the top of the standing seams to provide a finished appearance.

FACTORY INSTALLED TRUSSED ROOF SYSTEM

The building manufacturer shall provide Wooden roof trusses, plywood sheathing, underlayment felt to be factory applied and be covered by the finished roof surface which shall be factory applied to the building to form a gabled roof system as shown.

When installed, the trusses shall be covered by 1/2" thick C-C Grade plywood. The selected roof material shall be called out in these specifications

When required, the roof structure shall include the roof hatches being built into the roof field by the station manufacturer using the same materials as specified above.

Metal Facia and Soffits shall be installed on the building by the building manufacturer. These materials for the facia and soffit shall be complimentary in color and texture and approved by the Engineer.

A ridge line, metal airvent system shall be installed as a part of the roof.

For review by the Engineer-of-Record, the roof system shall be designed and stamped by a Registered Professional Engineer in the State of Kentucky and provided with the equipment submittals.

REGISTERED PROFESSIONAL ENGINEER REVIEW

The base substructure, building and the means of attaching the building to the foundation shall be reviewed and stamped by a Kentucky Registered Professional Engineer.

BUILDING SUBSTRUCTURE

The base/floor system substructure shall be made up of steel plate and standard structural steel shapes of the sizes and weights sufficient to bear the loading placed on the base by shipping and operation.

The substructure shall be designed to support the building live and dead loads plus the burden imposed by loading, transporting and unloading of this equipment.

All steel plates used in the substructure shall meet or exceed the requirements of ASTM-A36. The structural shapes (channels and angles) shall be of the thickness/weight as shown on the plans for this item and shall meet or exceed the requirements for ASTM A-36. The structural rectangular or square tubing shall be of the wall gauge as shown on the plans for this item and shall meet or exceed the requirements for ASTM A-500 Grade B.

On the substructure on the floor plate, indented approximately 6⁷/₈", there shall be welded a 1-1/2" x 2" x 1/8" steel angle iron with drilled holes. This angle steel piece shall be the bracket through which the building is attached to the base substructure.

SKID INSULATION

The steel skid underside shall be insulated with a isocyanurate (flame retardant urethane) foam insulating material. The insulation shall be applied in each of the spaces between the structural members and the interior perimeter of the skid by spray and other approved methods. The insulation shall be 2 inches thick and have a minimum density (compressibility) of 1.7-1.8 lbs/cu. ft. nominal. The insulation shall have a ASTM E-84 flame spread rating of less than 30.

FLOOR DRAIN

The station shall have floor drains as shown on the drawing.

The floor drains shall be a 4" grated opening with 4" I.D threaded hub for connection of a drain line up under the station floor.

PIPING FLOOR PENETRATIONS

Where suction and discharge piping, or any other pressure piping, passes through the station floor plate and base sub-structure, that area of the floor shall be provided with a grout sleeve made up of steel pipe of 9" height and of sufficient annular diameter to pass a full size pipe flange for the pipe size shown.

The steel sleeve shall be welded into the floor plate with a 1" projection above the floor in the station. Following installation of the inlet and outlet pipes, the installing contractor shall be responsible for furnishing and installing grout to close the opening around the installed pipe.

SAFETY FLOOR MATTING

The walkway areas (that space from the entrance ladder to the control panel and the entire NEC clearance area) shall be covered with a rubber drainage runner. The runner shall be medium duty, 1/2 inch minimum thickness of open slot design allowing fluids to drain understanding or walking surfaces. The runner shall have a tread design to promote sure footing. The underside of the runner shall have a raise knob design to permit aeration and drainage, and to reduce runner fatigue. The runner shall not be glued to the floor.

PUMP OPERATING CONDITIONS - PUMP STATION

The pump station shall be capable of delivering the fluid medium at the following capacities and heads when operating at 0 feet minimum suction pressure.

PUMPS #1, #2

The pumps shall be Close Coupled End Suction by as Model 20709LC.

Design Point: 250 GPM @ 150 feet TDH;
 Maximum Point: 450 GPM @ 75 feet TDH;
 NPSHr: 12 feet;
 Suction Pressure: 30-45 PSI;
 Discharge Pressure: 100 PSI;
 Pump Efficiency at Design Point: 79%
 Pump Power: Non-overloading for 15 rated h.p.
 Motor Speed: 3530 rpm nominal.
 Electrical Power: 240/480 volt 3 phase, 60 cycle.

PUMPS – CLOSE COUPLED HORIZONTAL END SUCTION, CENTRIFUGAL

The pumps employed within the pump station shall be of the close coupled, horizontal end suction, centrifugal configuration. The pumps shall be NSF61 certified.

The pumps shall be of close grain cast iron construction. The pumps shall conform to the detailed specifications as set forth below:

The pumps shall be Volute style with the pump casing bolted to adapter, with recessed lock fit to insure alignment. No stud or bolt holes are tapped through casing to liquid ways. Tapping openings provided for priming, venting, draining and suction and discharge gauge connections. Piping connection are to be as shown on the pump data sheets.

Impellers are to be single suction type, cast in one piece. All impellers are to be statically balanced to insure smooth operation, also hydraulically balanced except in some small sizes where end thrust is but a minor factor.

Wearing rings shall be renewable, be set on both the impeller and body and be set maintain proper running clearance with impeller hubs to minimize leakage between the suction and discharge.

Shaft sleeves shall be shouldered onto the shaft near impeller to cover the full length of shaft from impeller hub to motor end bracket by being in compression over the shaft protecting shaft from contact with liquid.

The stuffing box shall be cast integral with the pump casing. The stuffing box shall contain a single face type mechanical seal. The seal shall have a carbon rotating head against a Ni-Resist stationary face and be complete with a Buna-N boot with stainless steel spring and spring retainer.

The motor adaptor shall maintain a rigid, bolted, registered assembly between motor and the casing by a machined lock between adapter and motor end bracket keeping the adapter and casing in permanent alignment with motor and motor shaft.

Motor configuration shall be as a close-coupled assembled as an integral part of the complete units. The extended motor shaft carries the impeller and shaft sleeve. Motor bearings are ball bearing type, designed to carry all radial and thrust loads, and are installed in sealed housings which retain lubricant and exclude dirt and moisture.

PUMP/MOTOR VIBRATION ISOLATION PADS

The pump/motor assembly shall be mounted to a fabricated steel base built specifically for the pump/motor to be mounted. Each mounting or attachment point shall be complete with a vibration isolation pad.

The pad will be in two (2) parts, a 1/4" base layer followed by a 5/8" upper layer and be a nominal 2" x 2" square size for pump/motor combinations weighing up to 1500 pounds.

PUMP SUPPORT STANDS

The pump support stands shall be structural steel C-channel, standard weight or steel plate bent to form a channel. The bent steel plate shall be of sufficient thickness to support the pump and motor. A plate or channel shall be welded between the pump supports to form an "H" configuration for rigidity. The base of the legs shall be continuously welded to the steel floor.

PUMP MOTOR CONFIGURATION

The pump driver shall be a NEMA Design B, three phase, alternating current, (squirrel cage) induction motor, continuous duty rated, with motor insulation as Class F for Class B Heat Rise.

Motor efficiencies shall be Premium Efficient as stated in NEMA MG 1, 2011 Part 12, Table 12-12 for the motor enclosure, open or closed.

Motor Service factor shall be 1.15 on the nameplate, reduced to 1.0 when used with variable frequency drives per NEMA MG 1 – 2011, Part 31.3.7.

The motor enclosure shall be Open Drip Proof (ODP).

Motors of 600 volts or less shall meet the requirements of NEMA MG 1 2011 Part 31.4.4.2 for ability to sustain voltage spikes when used with variable frequency drives under usual conditions

These motors are for use with variable frequency drives.

PIPING-TRANSMISSION – STEEL PIPE

The piping shall conform to AWWA Standard C-200.

Piping 3 inches in diameter and above shall be steel and conform to material specification ASTM A-53(CW) for nominal pipe size four (4) inch and smaller and ASTM A-53(ERW) Grade B for nominal pipe size five (5) inches and larger. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively.

Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as amended in 1992 for Class 150 and Class 300 flanges.

The piping sizes shall be as shown on the drawing.
 Size 10 inch and below - Schedule 40
 Size 12 inch and above - Standard weight (.375" wall)

PIPE WELDING

All pipe welds shall be performed by certified welders employed by the pump station manufacturer. As part of the equipment submittal, the pump station manufacturer shall provide copies of the welding certificates of the employees who are to perform the pipe welds.

Shop welders shall be certified in accordance with ASME BPVC Section IX or AWS D1.1. Certification shall be done by an independent testing laboratory giving certification for the weld positions for which the tests were performed.

PIPE SURFACE PREPARATION

All piping inside and outside surfaces shall be prepared by grit blasting, or other abrasive blasting, prior to any welds taking place to minimum SP-6 finish.

PIPE CUTTING

Piping of 4" diameter and smaller may be cut by saw.

Piping of 6" diameter and larger shall be bevel cut, and Oxyfuel or Plasma-arc cutting techniques shall be used to assure and facilitate bevel pipe cuts.

SADDLE CUTS AND WELDS

Saddle cuts in pipe made in preparation for a saddle weld of a pipe at an angle to a pipe shall be made with numerically controlled, plasma cutting machines. Similarly, saddle end cuts to pipes to make a saddle mating piece shall be done with the same numerically controlled plasma cutting equipment.

When the two saddle cut pieces are mated and welded with the MIG process, the internal finished weld shall be smooth and free of inclusions, crevices and other corrosion sites.

PIPE WELDING TECHNIQUES

Pipe welds shall be performed by metal added, inert gas shielded arc welding (MIG) techniques wherein the weld heat settings, the wire feed speed and the traverse speed of the work below the welding are numerically set to assure proper weld fusion and penetration and repeatable welds.

In all cases, short circuit transfer, spray transfer or pulse-arc transfer modes of the gas metal arc welding process shall be used.

When utilizing the short circuit mode, shielding gas consisting of 50% carbon dioxide and 50% argon gas shall be used. When utilizing the spray or pulse-arc transfer modes, a shielding gas consisting of 5% carbon dioxide and 95% argon shall be used.

In all cases, welding wire with a minimum tensile strength of 70,000 psi shall be employed.

All flange welds and butt welds of equal size pipe shall be a single continuous nonstop weld around the complete circumference of the pipe. Whenever possible, vertical up weld passes will be applied to all pipe welds. No vertical down weld passes will be allowed.

Completed pipe welded assemblies shall create no internal obstruction, restriction or create any unintended sources of water deflection.

Piping of six (6) inch diameter and larger shall require a minimum of two (2) weld passes to complete each weld. The first pass, or root pass, shall be applied at the bottom of the bevel cut using the short circuit transfer welding mode, and the second pass, or cap pass, shall be applied over the root pass using the spray or pulse arc transfer welding modes to insure that at a minimum the total weld thickness shall be equal to thinnest of the two pieces being welded together.

The pipe shall be sand blasted, as specified elsewhere, before pipe weld and after pipe weld, before fusion bonded epoxy is applied.

WELD STANDOFFS

No welding shall be performed on fusion bonded coated piping after the coating process has been

performed.

Where any piping is to be welded after the application of fusion bonded epoxy coating to the inside of the pipe, at the point of the weld, a weld standoff must be welded to the pipe prior to the coating. The weld shall be made to the standoff and not onto the pipe.

TANK/WALL PENETRATION COATING PROTECTION SLEEVE

Where a fusion bonded epoxy interior coated pipe passes through the steel tank shell or a steel wall section, prior to fusion bonded coating of that pipe, a pipe sleeve shall be welded over the pipe in the area where the pipe passes through the steel sheet.

The sleeve shall be one-half (1/2") inch thickness and fit closely over the transmission pipe. The sleeve shall be seal welded to the transmission pipe at each end with a full and continuous fillet weld.

Following the welding of the sleeve to the transmission piping, the sleeve welds and the sleeve shall be grit blasted to an SP-6 finish so the pipe is prepared for fusion bonded epoxy coating by the process specified elsewhere in these documents.

PIPE SUPPORTS

Pipe supports by minimum sizing for:

- 8" and smaller piping shall be 2" x 3" x 3/16" wall rectangular tubing;
- 10" and larger piping shall be 3" x 4" x 1/4" wall rectangular tubing;
- 6" and larger piping shall be provided with "kick" bracing projecting fully from the underside of the pipe to the floor at an angle of no less than 15 degrees from vertical out at a right angle to the run of the pipe being supported. These "kick" braces shall be in addition to the vertical pipe supports called out above.

Pipe supports are to be fully welded at both end points to the pipe and steel floor where required.

Where components are to be supported and may require disassembly at some time, the supports for these components shall be welded at the bottom and bolted at the top by use of a bolt yoke welded to the top of the support and bolted into the flange connection picking up at least two bolts.

RISER PIPE VERTICAL SUPPORTS

All of the inlet and outlet vertical riser pipes shall be provided each with, two (2) structural steel, angle pipe support welded to the weldment plates on the vertical riser pipe to down to the floor. These supports shall be opposed by at least 120 degrees around the pipe. The minimum member size for these supports shall be 2" x 3" x 1/4" structural steel tubing for piping sized 8" and below and 3" x 4" x 1/4" structural steel tubing for piping 10" sized 10" and above.

FUSION BONDED EPOXY INTERNAL PIPE COATING

The internal surfaces of piping to be fusion bonded coated shall be grit blasted to an SP-10 finish with the finish profile required by the coating material manufacturer.

The internal, wetted surfaces of the steel transmission piping shall have applied to it a Fusion Bonded Epoxy Coating on the interior pipe surface. The coating shall be applied and meet the testing requirements of Table 1 and Table 2 with the exception of Table 2 section 7 per AWWA C-213.

The powder coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material.

Prior to shipment of the station, the station manufacturer shall provide in writing to the Engineer certification that the fusion bonded epoxy coating has been applied to all internal surfaces of the steel piping using the proper method. Said certification shall show under the station manufacturer's letterhead:

- Date of application;
- Material manufacturer and product designation including a product data sheet for the coating;
- Applier of the fusion bonded coating, name, address and phone number;
- Notarized signature of an officer of the station manufacturing company stating the fusion bonded epoxy coating was applied to AWWA Standard C213-91 or the latest revision.

COATINGS - CORROSION PROTECTION

All interior and exterior surfaces of the exposed steel structure, transmission piping, and fittings shall be gritblasted equal to commercial blast cleaning (SSPC-SP6). Following fabrication all exposed surfaces of the station, interior and exterior, shall be coated according to the following requirements.

WELDMENT PRIME COATING

All weldments will be pretreated by hand to provide additional corrosion protection using the same product as the base coat. Following the pretreatment full coating application shall take place.

BASE COATING

The base coating shall take place immediately after surface preparation. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings.

TOP COATING

Following the base coating application, a full finish coating application shall take place. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings. The base and finish coats shall provide a total dry mil thickness of 8.0 mils. The finish shall be "flint gray" in color.

POST-ASSEMBLY COATING

Following assembly and just prior to shipping, there shall take place a thorough cleaning of the floor of the station followed by a rolled on coating of the two part epoxy coating to cover over any scuffing or scaring that might have occurred during assembly.

FLOOR COATING AND CORROSION PROTECTION SYSTEM

The exposed surfaces of the structural steel base shall have a non-skid coating of a two-component, 100% high performance aromatic polyurea spray elastomer system with zero VOC (Volatile Organic Compounds), 100% solid. The coating shall offer outstanding performance and superior elastomeric protection for various substrates. The coating shall be designed as a user-friendly product for moisture insensitive applications because of its pure polyurea chemistry, and offer exceptional adhesion properties for properly prepared substrates. The high performance formulation shall produce an excellent skin formation for chemical resistance and moisture protection. The coating shall be dark gray in color.

Both the Iso "A" Side and Resin "B" Side shall be preconditioned between 70-90°F before application. Iso "A" and Polyol "B" components must be pumped by low-pressure transfer pumps to a suitable high-pressure proportional pumping system.

Temperature Settings:	
Iso "A" Block Heater:	140-160°F
Resin "B" Block Heater:	140-160°F
Hoses (Iso and Polyol)	140-150°F
Equipment Hydraulic Pressure:	2,000-2,500PSI

CHEMICAL TECHNICAL DATA:

Mix Ratio by Volume: Gel Time:	1A:1B 6-9 Sec
Tack Free Time:	9-12 Sec
Viscosity (cps) @ 77°F	
"A" Iso Side:	1,000±100
"B" Resin Side:	370±50
Material Density (lbs/gal) @ 77°F "A" "A" Iso	
Side:	9.5 lbs/gal
"B" Resin Side:	8.4 lbs/gal.

BASIC PHYSICAL PROPERTIES:

All tests are performed by OCM Test Laboratories.

- ISO 17025 Certified
- American Association for Laboratory Accreditation (A2LA)

Test Name	Test Methods	Value
Hardness Shore D	ASTM D2240	60±1
Coefficient of Friction	ASTM D1894	
Static		0.305
Kinetic		0.127
Dielectric Const.	ASTM D150	3.6
Dissipation Factor	ASTM D150	0.031
Volume Resistance	ASTM D257	2.3x10 ¹⁴ ohm cm
Elongation	ASTM D412	162%
Flexural Strength ASTM D790		2,630 PSI
Flexural Modulus	ASTM D790	0.056 MSI
Fungus Test	MIL-STD 810F	Pass
Pull-off Test–Adhesion	ASTM C297	
To Metal – No Primer		1,800 PSI
To Metal – XPM Primer		1,910 PSI
To Metal – LXSF515 Primer		1,870 PSI
Taber Abrasion	ASTM D4060	0.06980
(gm Loss/1000 cycles)		
Tear Strength	ASTM D624	783 ppi
Tensile Strength	ASTM D412	3,432 PSI
Water Vapor Trans.	ASTM E96	0.499 Grains/Hr Sq.Ft.

The chemical resistance testing for the coating shall be per ASTM D543 for immersion in fluids methods. Additional product certifications shall include USFDA Coatings for Incidental Food Contact Applications Certified by Keller and Heckman LLP and MIL-STD-810F.

SERVICE CONNECTIONS ON INTERNAL PIPING

All plumbed devices within the station eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of adaptors and couplings as shown on the drawings; no less than the quantity of couplings and adaptors shown shall be allowed.

RESTRAINING POINTS

The main inlet and outlet piping to the station shall each be provided with two (2)/four (4) restraining points as welded on "eyes" or similar device welded to the underside of the base structure framing as shown to facilitate the attachment of joint restraint tie rods or other device to be used in retarding any pipe movement at the connections.

COMPRESSION COUPLINGS

The station piping shall include a variety of compression type, flexible coupling to prevent binding and facilitate removal of associated equipment. These couplings are to be where shown on the plans. In lieu of a compression coupling, a flanged coupling adapter (FCA) may be used.

Grooved fittings may not be used under any circumstance.

All compression couplings or flanged coupling adapters (FCA), and flexible connectors/expansion joints shall include a minimum of two (2) zinc coated steel threaded rods across the joint with appropriate bolted restraining points.

ELASTOMER PIPE CONNECTOR

The inlet side of each booster pump shall include an elastomer connector to help isolate vibration and noise in the piping system. The elastomer connector shall be of single sphere design, constructed of neoprene and nylon with bias-ply tire reinforcing cord to provide a 225 psi working pressure rating to a minimum of 120 degrees F. The elastomer connector shall pass through the plate steel flanges designed to grip the connector so the connector seals without gaskets when the flange bolts are drawn up.

A control joint limiting pipe connector movement shall be supplied with each pipe connector.

LINE PRESSURE GAUGES

Combination pressure gauges shall have a built-in pressure snubber and have 4-1/2" minimum diameter faces and turret style case, black fiberglass-reinforced thermoplastic with a clear acrylic window with Buna-N gasket. The movement shall be rotary; the bourdon tube shall be copper alloy C-type. The gauge shall have a 1/4" MNPT lower mount process connection and contain a 0.6mm copper alloy restrictor. Combination pressure gauge range and scale graduations shall be in psi and feet of water as follows:

Gauge ranges shall be established by the Engineer for each of the suction and discharge gauges for each pump station.

All gauges will be panel mounted off the pipeline and be connected to their respective sensing point. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal. Gauges mounted directly to the pipeline or at the sensing point will not be accepted.

Gauge ranges, markings and gauge location shall be identified in the submittal documents.

STATIC AND SENSING LINES

All gauge, switch and transmitter sensing lines shall be minimum 1/4" OD white polypropylene tubing run from the sensing point and a ball valve to the point of device mounting.

The pilot tubing shall be run in a workmanlike manner with elastomeric/stainless steel mounting straps to securely hold the tubing to be free of stress and vibration. The alignment and organization of the sensing lines shall be continuously rising.

SAMPLE TAP

A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.

HOSE BIBB WITH VACUUM BREAKER

There shall be provided a standard hose bibb with valve and vacuum breaker on the suction piping. The hose bibb connection shall be through a pressure regulator if the header pressure would exceed 60 psi.

BALL VALVES

The ball valves will be 2-piece, full-port design with blow-out proof stem. The seats, packing and seal shall be PTFE. Ball valves shall be provided with an adjustable stem packing nut. The body and retainer shall be lead free brass (DZR). The ball shall be lead free brass (DZR), chrome plated for sizes ¼"-1" and 316SS for sizes 1-1/4"-4". The handle shall have a distinctive white "lead free" handle grip and blue "lead free" hanging tag. The valves will be NPTxNPT threaded pattern. Maximum working pressure shall be 600 psi up to 2" and 400 PSI for sizes 2-1/2" to 4".

BUTTERFLY VALVES

Valve body shall be one-piece wafer or lug design with extended neck to allow for 2" of piping insulation. Flange locating holes shall be provided on wafer bodies to allow for quick and precise alignment during valve installation. Flange hole drilling per international flange standard as specified. A non-corrosive bushing and a self-adjusting stem seal shall be provided. No field adjustment shall be necessary to maintain optimum field performance.

The disc edge and hub on metal discs shall be spherically machined and hand polished for torque and maximum sealing capability. Disc shall be Nylon 11 coated ductile iron.

The stem shall be one-piece design. Disc to stem connection shall be an internal double "D" design with no possible leak paths in the disc-to-stem connection. External disc-to-stem connections such as disc screws or pins are not allowed. Stem shall be mechanically retained in the body neck and no part of the stem shall be exposed to the line media.

The seat shall be tongue-and-groove seat with a primary hub seal and a molded flange O-ring for weld-neck and slip-on flanges. The seat shall totally encapsulate the body isolating it from the line media and no flange gaskets shall be required.

The valve shall be rated for bubble-tight shut-off at pressures of 175 PSI for 2"-12" and 150 PSI for 14"-20".

Valve manufacturer:

- A. Bray Series 30/31
- B. Keystone 221/222

MANUAL VALVE ACTUATORS

Manually operated butterfly valves size 6" and smaller shall be equipped with lever style operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.

Manually operated butterfly valves size 8" and larger shall be equipped with travelling nut style handwheel operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.

SILENT CHECK VALVES – WAFER STYLE

Silent check valves shall be wafer style, non-slam and made to set between ANSI Class 125 flanges.

Sizes shall be as shown. (2" – 10")

The body of the check valve shall be cast iron. The plug and seat shall be bronze and conform to ASTM Designation B-584. The seat shall contain a Buna-N seal to provide zero leakage. The seal design shall provide for both a metal to metal low and high pressure without over-loading or damaging the Buna-N seal. The guide bushings shall be bronze copper alloy and conform to ASTM Designation B-584. The valve spring and seat retainers shall be stainless steel and conform to ASTM Designation A-313. The valve plug shall be guided at both ends by a center shaft integral with the valve plug. Alignment of the center shaft shall be provided by guide bushings.

Silent Check Valve manufacturer:

- A. Val-Matic Model 1400
- B. APCO Series 300A

GATE VALVES

Gate Valves shall conform to the latest version of AWWA Standard C-515 covering Resilient Seated Gate Valves for Water Supply Service.

The valves shall be 150# flanged with a ductile iron body and bonnet. The wedge shall be totally encapsulated with rubber. The sealing rubber shall be permanently bonded to the wedge to meet ASTM tests for rubber metal bond ATSM D249. Working pressure for valve sizes 2"-12" shall be 250 PSI.

Valves shall be supplied with O-Ring seals at all joints. No flat gaskets shall be allowed.

The valves shall be non-rising, opening by turning left to right. The handwheel shall have the "Open" and an arrow cast in the metal to indicate the direction to open.

Stems for NRS assemblies shall be cast bronze with integral collars in full compliance with AWWA. The stem shall operate with bronze stem nuts, independent of stem. The stem shall have (2) O-Rings located above thrust collar and (1) O-Ring below. O-Rings shall be replaceable with valve fully opened and subjected to full pressure. Stems shall also have (2) low torque thrust bearings located above and below stem collar to reduce friction during operation.

Waterway shall be smooth, unobstructed and free of all pockets, cavities and depressions in the seat area.

The body, bonnet and stuffing plate shall be coated with fusion bonded epoxy, both interior and exterior on body and bonnet. Epoxy shall be applied in accordance with AWWA C550 and be NSF61 and NSF372 certified.

Each valve shall have a maker's name, pressure rating, and year in which it was manufactured cast in the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to requirements of AWWA.

Valves shall have all brass components cast and assembled in the USA.

Valve manufacturer:

- A. Kennedy Valve

- B. M&H
- C. Clow

HYDRAULIC ACTUATED CONTROL VALVES - GENERAL

The valve configuration as shown shall be hydraulically operated, single diaphragm actuated. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Valve body and cover shall be epoxy coated. The stainless steel seat with integral bearing shall be of the solid, one piece design.

The diaphragm assembly shall contain a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures. The stem shall be fully guided through its complete stroke by a removable bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

The pilot control system shall include CK2 isolation valves.

The pilot system shall include a closing speed control on all valves.

Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

The pressure relief pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds in the adjustable spring setting. The pilot control is normally held closed by the force of the compression on the spring above the diaphragm and it opens when the pressure acting on the underside of the diaphragm exceeds the spring setting. The pressure relief valve shall be supplied with the Dura-Kleen® stem (KD option).

The Control Valve shall be a Cla-Val Model 50-01.

MAGNETIC FLOWMETER

General

Electromagnetic flow meters for permanent installations both above and below ground. The meters shall utilize bipolar pulse DC coil excitation to measure voltage induced by the flow of conductive liquid through a magnetic flux. The voltage shall be linearly proportional to flow velocity from 0.033 to 33 feet per second.

Sensor

The sensor shall consist of a stainless steel flow tube with ANSI Class150 B16.5 or AWWA C207 carbon steel or stainless steel flanges.

The sensor liner and electrode material shall be chosen to be compatible with the process fluid. All fluids require a minimum conductivity of 5µS/cm (20µS/cm for deionized water).

The sensor tube shall be lined with polyurethane, hard rubber, or PTFE based upon the size of the flow meter and the process media conditions. NSF-61 shall be available as option.

The sensor shall house two measuring electrodes, a grounding electrode, and one for physical empty pipe detection. The electrodes shall be bullet-nosed shaped and made of 316L SS or Alloy C22 (listed by the application and instrument schedule).

The sensor shall be rated for NEMA 4X service as standard; Optional NEMA6/IP67 for temporary immersion or NEMA6P/IP68 for permanent immersion.

Transmitter

The transmitter shall be a three-stage microprocessor controller mounted integrally or remotely. The transmitter shall incorporate a universal 100-240 VAC/18-30 VDC power supply. The transmitter housing will carry a NEMA 4X rating and shall be constructed to prevent moisture ingress, promote corrosion resistance, and be impervious to saline environments.

The transmitter display shall indicate simultaneous flow rate and total flow with 3 totalizers (forward, reverse and net total) and user-selectable engineering units and readout of diagnostic error messages.

The Transmitter output shall be specified as either 4-20mA HART; 0-20mA, pulse/frequency/switch; Modbus RS-485, Profibus DP, or EtherNet/IP

The transmitter shall support commissioning options through a device driver-less operation via an internal web server accessible through a standard RJ-45 Ethernet port or a WLAN (Wireless Local Area Network) connection as specified.

The transmitter shall include an onboard method to verify flow meter performance to the original manufacturer specifications without the use of external handhelds, interfaces, or special tooling.

Installation

The sensor shall house two measuring electrodes, a grounding electrode, and one for physical empty pipe detection. The electrodes shall be bullet-nosed shaped and made of 316L SS or Alloy C22. Straight run requirements are 5 diameters upstream and 2 diameters downstream to maintain laminar flow and full specified accuracy.

Sensor shall have optional unrestricted mounting magnetic flowmeter sensor for applications without the typical inlet/outlet straight pipe run requirements. The full bore magnetic flowmeter in sizes 1"-12" shall maintain zero pressure loss while achieving 0.5% of rate accuracy.

The Inline Magnetic Flow Meter shall be an – Endress+Hauser Promag W400

METER TEST PORT

The meter installation shall be complete with a meter test port as shown on the plans for this item. The test port shall consist of a NPT coupling in the pipe downstream of the meter capable of accommodating a threaded by hose connection adapter. The connection shall be plugged.

PRESSURE TESTING

When the station plumbing is completed, the pressure piping within the station (including valves, pumps, control valves, and fittings), connections as make up the entire system shall be hydrostatically tested at a pressure of 150 psi or a pressure equal to the lowest test pressure rating of the equipment within the tested system, whichever is lesser pressure. The test pressure shall be applied for a minimum of 20 minutes, during which time all joints, connections and seams shall be checked for leaking. Any deficiencies found shall be repaired and the system shall be retested.

The results of this testing shall be transmitted in writing to the Engineer prior to shipment of the station and shall note test pressure, time at full pressure and be signed by the Quality Control Manager or test

technician.

ELECTRICAL DESIGN, ASSEMBLY & TEST

The electrical apparatus and control panel design, assembly, and installation, and the integration of component parts will be the responsibility of the manufacturer of record for this booster pumping equipment. That manufacturer shall maintain at his regular place of business a complete electrical design, assembly and test facility to assure continuity of electrical design with equipment application. Control panels designed, assembled or tested at other than the regular production facilities or by other than the regular production employees of the manufacturer of record for this booster pumping equipment will not be approved.

CONFORMANCE TO BASIC ELECTRICAL STANDARDS

The manufacturer of electrical control panels and their mounting and installation shall be done in strict accordance with the requirements of UL Standard 508A and the National Electrical Code (NEC), NFPA 70 latest revision so as to afford a measure of security as to the ability of the eventual owner to safely operate the equipment.

No exceptions to the requirements of these codes and standards will be allowed; failure to meet these requirements will be cause to remove the equipment and correct the violation.

U.L. LISTING

All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with Underwriter's Laboratories (cUL) Standard 508A "Industrial Control Equipment." The cUL label shall also include an SE "Service Entrance" rating stating that the main distribution panel is suitable for use as service entrance equipment. The panels shall be shop inspected by cUL, or constructed in a cUL recognized facility. All panels shall bear a serialized cUL label indicating acceptance under Standard 508A and under Enclosed Industrial Control Panel or Service Equipment Panel.

E.T.L. LISTING

All control panels shall be E.T.L. Listed by Interek Testing Services (ITS) under the Industrial Control Panel (ICP) Category. Each completed control panel shall bear an ETL listing label stating that the panel conforms to UL STD 508A and is certified to CAN/CSA STD C22.2 NO. 14. The listing label shall include the station manufacturer's name, address and telephone number. The station manufacturer shall have quarterly inspections performed by ETL at the manufacturer's facility to ensure that the products being listed comply with the report and procedural guide for that product.

EQUIPMENT GROUNDING

Each electrical equipment item in the station shall be properly grounded per Section 250 of the National Electrical Code. Items to be grounded include, but are not limited to, pump motor frames, control panel, transformer, convenience receptacles, dedicated receptacle for heater, air conditioner, dehumidifier, lights, light switch, exhaust fans and pressure switches.

All ground wires from installed equipment shall be in conduit and shall lead back to the control panel to a copper ground buss specific for grounding purposes and so labeled. The ground buss shall be complete with a lug large enough to accept the installing electrician's bare copper earth ground wire. The bus shall serve as a bond between the earth ground and the equipment ground wires.

PANEL MOUNTING HARDWARE

Metal framing channel and hangers shall be used exclusively for mounting of electrical panels and electrical components except for those specifically designated otherwise.

When mounting panels in buildings with ¾" plywood interior sheathing, certain panels and components may be mounted by screwing these devices into the wall. The maximum weight of a panel mounted with four lag screws cannot exceed 250#. The lag screws must either be 5/16" or 3/8" diameter and be fully threaded.

ELECTRICAL SERVICE

The electrical service provided for this station will be 480 volt, 3 phase, 60 Hertz.

ELECTRICAL DISTRIBUTION PANEL

The distribution panel shall be a single section, bolt-on panelboard, bottom feed, surface mount, SE rated, NEMA 1 enclosure for three phase, 480 VAC power and with aluminum bus. Circuit Breakers are rated for 10 KAIC.

The main circuit breaker shall be rated for 100 amp service.

The distribution panel shall be complete with the following branch circuit breakers:

- One (1) 3-pole, 100 amp Main Breaker;
- Two (2) 3-pole, 40 amp Pump Motor Breakers;
- One (1) 3-pole, 30 amp Surge Protection Device Breaker
- One (1) 3-pole, 15 amp Phase Monitor Breaker;
- One (1) 2-pole, 40 amp Primary Transformer Breaker;

Nameplates will be provided in etched phenolic.

SECONDARY CIRCUIT BREAKER (LIGHTING) PANEL

The lighting panel shall be a single section, bolt-on panelboard, bottom feed, surface mount, NEMA 1 enclosure for single phase, 240/120 VAC power and with aluminum bus. Circuit Breakers are rated for 10 KAIC.

There shall be provided, thermal-magnetic trip circuit breakers as follows:

- One (1) Transformer Breaker, Secondary Side, XX amps;
- Auxiliary Circuit Breakers, as follows:
 1. 1-pole, 15amp Controls
 2. 1-pole, 15amp Telemetry
 3. 1-pole, 15amp Pump Room Lights
 4. 1-pole, 15amp Pump Room Convenience Outlets
 5. 1-pole, 20amp Generator Block Heater
 6. 1-pole, 15amp Generator Battery Charger
 7. 1-pole, 15amp Pump Room Dehumidifier
 8. 2-pole, 30amp HVAC
 9. 1-pole, 15amp Spare
 10. 1-pole, 15amp Spare
 11. 1-pole, 20amp Spare
 12. 1-pole, 20amp Spare

ELECTRICAL APPARATUS - CONTROL PANEL

The time delay relays and control relays shall be incorporated into one (1) NEMA 1 control panel.

There shall be provided, fuse protection in accordance with the drive manufacturer's installation guidelines and as required in UL61800-5-1.

ELECTRICAL APPARATUS - ADJUSTABLE FREQUENCY DRIVES

This specification is to cover a complete Variable Frequency Drive (VFD aka: VFD, AFD, ASD, Inverter, AC Drive, et al) designed for use with a standard AC induction motor in water and wastewater applications. The VFD must provide a V/Hz or sensor-less vector mode of operation.

The VFD package as specified herein shall be UL61800-5-1 listed and CSA C.22.2 No. 274-17 listed as a complete assembly. The VFD shall be furnished in an UL Type 1 (NEMA 1) listed enclosure rated as specified for operation at ambient temperatures between -15°C and 40°C at an altitude not exceeding 3300 feet, with relative humidity less than 95% and no condensation allowed.

The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum. The VFD efficiency shall be 96.5% or better at full speed and load. The VFD shall have a DC bus voltage controller to automatically maintain the DC bus levels in high or low line conditions for the purpose of maintaining full motor voltage at all times. The short term normal duty overload current capacity shall be 110% of rated current for one (1) minute out of ten (10) minutes

All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs. Control connections shall remain consistent for all power ratings

The control panel shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bump-less transfer" of speed reference when switching between "Auto" and "Hand" modes. There shall be a possibility to reset the VFD from the control panel. The control panel shall include a backlit LCD. The display shall be in complete words, in a language selectable by the user, for programming and fault diagnostics (alphanumeric fault codes are not acceptable). The control panel shall have a real-time clock with battery backup for adding time stamps to events, faults, warnings and also timer functions utilizing real-time clock. There shall be an editable home-view in the control panel to allow different customer specific configurations.

A dedicated "Help" button shall be available on the control panel. The Help button shall provide context sensitive assistance for programming and troubleshooting. The control panel shall provide interactive assistants (wizards) to help to commission and use the drive.

The control panel shall provide a clear, interactive, context sensitive menu based user interface to make it easy to adjust the settings of the drive. The control panel shall provide an easy to use I/O menu, where the user can see the status and function of all the analog and digital inputs and outputs. The control panel shall have a menu, which contains diagnostic data about the drive operation collected in one single location. The data shall include data about active faults, warnings and events. In addition the data shall contain a summary of VFD active control sources.

The user shall be able to take a screen capture snapshot of the display with the control panel and be able to download the screen capture for user's computer for further purposes. The user shall be able to connect a PC tool with a USB cable to the control panel to be able to set up and control the VFD. It shall be possible to connect the USB cable without using any tools.

The VFD shall have 2 quick ramps that allow for quick acceleration and/or deceleration of the pump motor.

The VFD shall offer a pump cleaning feature to reduce build-up of debris on the pump impeller. This feature can be activated by: Every start or Stop, when drive is in a underload / overload condition, timed interval or digital input. The cleaning cycle status shall be visible in the panel screen when cleaning is active. The VFD shall operate normally after the cleaning cycle is completed.

The VFD shall offer torque boost for applications where increased torque is needed for initial starting of the pump motor.

The VFD shall have intelligent pump control (IPC) with multi-pump functionality and an intelligent master/follower configuration for controlling up to 8 parallel pumps equipped with VFDs without additional modules. VFD shall have a parameter synchronization feature to program the PID, IPC and AI parameters in all parallel VFDs. The Functionality to start and stop the pumps based on capacity, operating time or efficiency of the pump to ensure each pump is operated regularly. The IPC shall be capable of level control, flow control, pressure control and pump alternation.

The VFD shall have soft pipe filling functionality, can be used to fill an empty pipe, by having programmable pipe fill time.

The VFD shall have a programmable Sleep functionality for PID control in pumping systems to stop the pump during low demand. "Sleep Boost" shall be available to reduce short cycling of the pump. The boost function will boost the pressure or water level before the pump shuts down to sleep.

The VFD shall provide a PLC kind programming capability as standard. It shall be possible to use different kinds of arithmetic, logical, selection, comparison and operation function blocks to monitor and control the VFD, functions, inputs, outputs and variables. There shall be a possibility to run different kinds of function block programs in different states and to set the criteria, when to change the state.

Real-time clock and calendar shall be available as standard for giving true time and date information to fault event history. The real-time clock should have a minimum of 10 years power-off back-up without optional components. Back-up battery shall be replaceable without opening the VFD enclosure. Real time clock shall be possible to use with timed functions, which shall allow controlling the VFD and its functions based on time of the day, day of the week, seasons of the year, holiday periods and holiday dates and special working periods and working days.

Timed functions should be possible to use for starting and stopping the drive, for selecting the speed reference, for selecting the PID loop controller's set-point, for controlling the relay outputs, for selection the control location, for giving the run permissive or interlock signal to the VFD, etc. There shall be also a boost function, which allows starting the VFD and/or its functions regardless, time of the day, day of the week, seasons or holidays.

The VFD shall be capable of controlling an induction motor, permanent magnet motor and synchronous reluctance motors as standard. Have a maximum allowed motor cable length 1000 feet (300 meters). The VFD shall commission an induction motor, permanent magnet motor and synchronous reluctance motor with the motor nameplate values only, without the need to get the motor values from other sources.

Scalar and vector control modes shall be supported and there shall be independent control chains and parameters for both of the motor control modes.

The overload rating of the VFD shall be 110% of its rated normal duty current for 1 minute every 10 minutes and with a minimum of 130% for 2 seconds every 1 minute. Overload ability shall be available at all times - not only at start.

The VFD shall be capable of sensing the loss of load (broken belt / broken coupling / dry pump) and signal the loss of load condition. The drive shall be possible to be programmed to signal this condition via a control panel warning, relay output and/or over the serial communications.

Relay outputs shall include programmable for on/off time delays that will allow for drive acceleration or deceleration to and from zero speed, without signaling a false underload condition.

It shall be possible to disconnect a motor running full speed by opening an optional contactor between motor and VFD without causing any damage to the VFD.

The VFD shall include a standard embedded functional safety feature Safe Torque Off, (STO), to make

the motor mechanically safe.

The VFD shall include an energy optimization circuit (flux optimization) that will automatically reduce applied motor voltage to the motor to reduce energy consumption by up to 10% and lower audible motor noise.

The VFD shall be capable of starting into a spinning load (forward or reverse) up to full speed and accelerate or decelerate to a set-point (flying start) without tripping or component damage.

The VFD shall restart after a power loss without the need to resend the start command. This feature shall be there regardless of the control source, control panel, I/O or fieldbus.

Flux braking shall be available, where the VFD controls the motor to dissipate the extra rotary energy as heat whenever braking is required. It shall be possible to use this flux braking feature to decelerate the motor from one speed to another – not only for stopping the motor.

Power-Loss-Ride-Through shall be programmable. If the incoming supply voltage is cut off, the VFD continues to operate using the kinetic energy of the rotating motor. The drive continues to be operational as long as the motor rotates and generates energy.

The VFD shall include a switching frequency control function. This adjusts the switching or carrier frequency, based on actual VFD temperature and allows the highest carrier frequency without de-rating the VFD or operating at high carrier frequency only at low speeds (temperature fold-back). It shall be possible to set a minimum and a reference switching frequency.

The VFD shall include a noise smoothing function, which distributes the acoustic motor noise over a range of frequencies instead of a single tonal frequency resulting in lower peak noise intensity.

The VFD shall have three (3) programmable critical frequency or critical speed lockout ranges to prevent the VFD from operating the load continuously on an undesirable speed range (skip frequencies)

All I/O terminals shall be color coded to simplify wiring and troubleshooting, and shall have a special mode for testing I/O and the drive configuration without being connected to equipment. All I/O shall be accessible (monitor and control) for fieldbus protocols (pass-through I/O). It shall be possible to monitor status of the I/O from VFDs control panel.

The VFD shall have at least two (2) programmable analog inputs. Both inputs shall accept current (0 to 20 mA or 4 to 20mA) or voltage (0 to 10 VDC) signals. The signal type selection, voltage or current, shall be made via VFD user interface. DIP-switches or jumpers are not allowed for input type programming. Analog Input shall have an inaccuracy of $\leq 1\%$ of full scale in both current and voltage modes.

The analog inputs shall be programmable to be used as: speed reference, frequency reference, pressure monitor, PID loop controller's set-point reference or signal feedback, or other defined inputs.

If the analog input reference (4 to 20 mA or 2 to 10 VDC) is lost, the VFD shall give the user the option of: (1) stopping and displaying a fault; (2) running at a programmable preset speed and displaying an alarm; (3) hold the VFD speed based on the last good reference received and displaying an alarm. The drive shall be programmable to signal this condition via a control panel warning, relay output and/or over the serial communication bus.

The VFD shall have at least two (2) programmable analog outputs (0 to 20 mA or 4 to 20 mA) out of which one shall be software configurable to be either voltage (0 to 10 VDC) or current output. Analog Output shall have an inaccuracy of $\leq 1\%$ of full scale in both current and voltage modes. The analog outputs shall be programmable to give an output signal proportional to frequency, motor speed, output voltage, output current, motor torque, motor power, DC bus voltage, active reference or other defined data.

The VFD shall have at least six (6) programmable digital inputs (24 VAC and 12 to 24 VDC, PNP or 5 pcs NPN) to connect to external devices, as follows:

- a. All inputs can be configurable for PTC sensors.
- b. There shall be a programmable run permissive circuit.
- c. Up to four (4) programmable free text interlock inputs shall be available.
- d. The VFD shall have at least one digital input which can be configured to receive a pulse signal up to 16 kHz.

The VFD shall have at least three (3) programmable digital Form-C relay (changeover) outputs. The relays shall include programmable on and off delay times and adjustable hysteresis.

The VFD shall have an EIA-485 (RS-485) port for serial communications as standard. The VFD shall be equipped with built-in fieldbus communication of type Modbus RTU. EtherNet/IP, Modbus/TCP, DeviceNet, PROFIBUS-DP, PROFINET protocols shall be available as plug-in and inbuilt options.

The VFD shall have an integral 5% impedance line reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC buss) reactors, or 5% AC line reactors. VFDs with only one DC reactor shall add AC line reactors.

All VFDs through 50 HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad.

THE VARIABLE FREQUENCY DRIVE UNITS SHALL BE ABB MODEL ACQ580.

ELECTRICAL POWER TRANSFORMER

Balanced 115/230 single phase power for the auxiliary circuits within the scope of each booster station shall be obtained by use of a 15 KVA dry, step down transformer. The transformer shall be wall mounting type, in a NEMA 3R non-ventilated weatherproof enclosure. Transformer shall operate with noise levels equal to or less than ANSI and NEMA standards. Transformer insulation shall be Class 180c.

The transformer shall meet the most recent standards for efficiency.

The unit shall be "UL" approved for indoor/outdoor application.

TELEMETRY CONTROL INTERFACE PANEL

It will be the responsibility of the station manufacturer to provide the following as an adjunct to the supplied telemetry equipment.

1. 1" telemetry entrance conduit complete to telemetry panel.
2. Size 12" x 12" NEMA 1 telemetry interface panel.
3. Separate 120 volt single phase power circuit in conduit to the telemetry interface panel.
4. Telemetry control circuits made up and in conduit from main control panel to telemetry interface panel terminal strip.
5. Metal framing channel to mount telemetry equipment.

ALARMS CONDITION AND OUTPUTS

The following alarms/status points shall be included within the booster pump station and wired back to the interface panel:

1. Provide indication as to the ATUO position of the HAND-OFF-AUTOMATIC selector switches on the pumps.
2. Unauthorized entry alarms on hatches and doors - The unauthorized entry alarm shall be driven by a door-mounted limit switch. The limit switch shall be the adjustable arm, roller contactor type which makes an internal SPST micro switch. The switch will be so mounted as to active anytime the entrance

man way door is opened.

3. Pump Motor Starter Failure – There shall be logic provided for detection, indication and alarm of the failure of the motor starter/controller.
4. Phase fail/power status alarm – The phase fail alarm shall be provided by 120 volt AC relay.
5. Low Suction Pressure alarm – The low suction pressure alarm shall be provided by the low suction lockout pressure switch as described elsewhere.
6. High Station Temperature Alarm – The station high temperature alarm shall be provided by a thermostat in the station.
7. Low Temperature Alarm – The station low temperature alarm shall be provided by a thermostat in the station.
8. Generator On/Off – Generator status shall be provided by generator panel as described elsewhere in these specifications.
9. Generator Alarm Condition – Indication of any alarm condition transmitted from the alarm control.
10. Automatic Transfer Switch (ATS) Status – Indication of the position of the ATS shall be provided. Utility or Emergency.

PUMP MOTOR RUN TIME METER

The control panel shall contain one running time meter supplied for each pump to show the cumulative number of hours of operation.

The meter shall be enclosed in a dust and moisture proof molded plastic case, suitable for flush mounting on the main control panel.

The meter dial shall register in hours and tenths of hours up to 99999.9 hours before repeating.

The meter shall be suitable for operation from a 115 volt, 60 cycle supply.

ELECTRICAL PHASE MONITOR

A phase monitor shall be supplied to protect three-phase equipment against phase loss, undervoltage and phase reversal conditions.

When a fault is sensed, the monitor output relay opens within two seconds or less to turn the equipment off and/or cause an audio or visual alarm. Both Delta and Wye systems may be monitored. The monitor shall have an automatic reset and shall also include an adjustable voltage delay.

The monitor shall have an indicator LED (glows when all conditions are normal and shall monitor phase sequence: ABC operate (will not operate CBA). The phase monitor shall be UL approved and CSA certified.

SURGE PROTECTION DEVICE

A secondary surge arrester shall be provided. Housing shall be Noryl and be ultrasonically sealed. Valve blocks shall be metal oxide with an insulating ceramic collar. Gap design shall be annular. The lead wire shall be permanently crimped to the upper electrode forming part of the gap structure.

Arresters shall be UL and CSA listed Lightning Protective Devices.

ELECTRICAL CONDUIT AND WIRING

All service entrance conduits power and signal, shall be rigid steel conduit, individually sized to accept the inbound service conductors and telemetry/telephone/radio cables.

These service entrance conduits shall be installed by the installing contractor through the provided conduit cutout in the building floor). The exterior conduit conduit cutouts shall be covered for shipment.

All wiring within the equipment enclosure and outside of the panel enclosures shall be run in conduit except where watertight flexible conduit is properly used to connect pump motors, fan motors, transformers, solenoid valves, limit switches, etc., where flexible connections are best utilized.

Devices and appliances where furnished by the original manufacturer and being equipped with a UL approved rubber cord and plug, may be plugged into a receptacle.

Equipment enclosure conduits shall be Schedule 40 PVC with solvent weld moisture-proof connections in minimum size 3/4" or larger, sized to handle the type, number and size of equipment conductors to be carried.

The conduiting shall be in compliance with Article 347 of the National Electrical Code and NEMA TC-2, Federal WC-1094A and UL-651 Underwriters Laboratory Specifications.

Where flexible conduit connections are necessary, the conduit used shall be Liquid-tight, flexible, totally nonmetallic, corrosion resistant, nonconductive, U.L. listed conduit sized to handle the type, number and size of equipment conductors to be carried - in compliance with Article 351 of the National Electrical Code.

Motor circuit conductors shall be sized for load. All branch circuit conductors supplying a single motor of one (1) horsepower or more shall have an ampacity of not less than 125 percent of the motor full load current rating, dual rated type THHN/THWN, as set forth in Article 310 and 430-B of the National Electrical Code, Schedule 310-13 for flame retardant, heat resistant thermoplastic, copper conductors in a nylon or equivalent outer covering.

Control and accessory wiring shall be sized for load, type MTW/AWM (Machine tool wire/appliance wiring material) as set forth in Article 310 and 670 of the National Electrical Code, Schedule 310-13 and NFPA Standard 79 for flame retardant, moisture, heat and oil resistant thermoplastic, copper conductors in compliance with NTMA and as listed by Underwriters Laboratories (AWM), except where accessories are furnished with a manufacturer supplied UL approved rubber cord and plug.

GAUGE PRESSURE TRANSMITTERS

Pressure transmitters shall be supplied to measure pump station suction and discharge pressure. The transmitters shall sense gauge pressure and transmit a 4-20 mA dc signal. The instruments shall measure pressure of a predetermined span. Range is to be fixed at 0-600 PSI. The accuracy shall be $\leq \pm 0.05\%$ of span.

Each transmitter shall provide an analog output and include a standard LCD with touch control and bluetooth to provide Intelligent transmitter. The one-line digital indicator shall display the measurement in any selected units.

All process-wetted parts of each instrument shall be Type 316L stainless steel. The transmitter shall be protected by a gasketed, weatherproof IP66 and IP68 enclosure.

The transmitter shall have 1/4 inch NPT female threaded tapping ports.

Gauge Pressure Transmitter manufacturer: Endress Hauser PMP71B.

DISCRETE SUCTION PRESSURE CONTROL

Separate from the control logic suction control of the pumping operation shall be provided by a bellows type, adjustable differential pressure switch. The switch shall be complete with a single pole, double throw contact block with 5 amp non-inductive rated contacts at 230 volts AC. The set points of the on/off cycle shall be independently adjustable through the full range of the switch rating.

1. Low Suction Cut-out, 4-150 psi.
- 1A. Adjustable Differential, 2-25 psi.

A pressure gauge shall be sub-panel mounted adjacent to the low suction pressure switch. The gauge and switch shall be so plumbed with the suction header sensing line that a common blow off valve can relieve pressure in both simultaneously for purposes of checking and calibrating the low suction lock-out.

ELECTRICAL DEVICES

Multi-position switches including Hand-Off-Automatic switches shall be oil tight, 3-position maintained and be located on the main control panel door.

Indicating lights shall be oil tight, with a full voltage, LED pilot light.

Nameplates shall be furnished on all panel front mounted switches and lights.

Switches, lights and pushbuttons shall be Schneider Electric, Series XB, 22 mm, Die Cast Chrome plated devices. Pilot lights shall be with protected LED's for 120 Vac operation as XB4BVG, pushbuttons shall be non-illuminated, momentary contact, extended lens as ZB4BL and the switches shall be 2 position maintained, 2 position right-to-left, 3 position maintained, 3 position momentary-to-center, 3 position momentary from left to center, and 3 position momentary from right to center with standard black lever as ZB4BD.

Switches

1. Pump #1 Hand-Off-Auto, 3-position;
2. Pump #2 Hand-Off-Auto, 3-position;
3. Pump #1 Telemetry-Test, 2-position;
4. Pump #2 Telemetry-Test, 2-position;

Lights

1. Red – Low Suction Pressure;
2. Red – High Discharge Pressure;
3. Green – Pump #1 in Operation;
4. Green – Pump #2 in Operation;
5. Red – Pump #1 Failure;
6. Red – Pump #2 Failure;

The solid state time delay relay shall have an adjustable time range of 10 seconds to 10 minutes. The relays shall be constructed to use a DIN rail mount socket so that the relays can be replaced without disturbing the wiring. The relay shall be complete with LED indicators for output and power.

Time Delay Relays

1. Low Suction Alarm On Delay Timer
2. Low Suction Alarm Reset Delay Timer
3. Lead Pump Start Delay Timer
4. Lead Pump Stop Delay Timer
5. Lag 1 Pump Start Delay Timer
6. Lag 1 Pump Stop Delay Timer
7. Lag 2 Pump Start Delay Timer
8. Lag 2 Pump Stop Delay Timer

The control panel door shall be complete on the interior with a stick-on transparency containing an "as-

built" reproduction of the electrical control panel schematic. The wiring diagram shall be a corrected "as-built" copy & contain individual wire numbers, circuit breaker numbers, switch designation & control function explanations.

STATION EXTERIOR LIGHTING

An exterior light shall be provided as located on the drawing. The light shall be 20 watt LED, 5K color, and 1532 lumens. Housing shall be one piece, injection molded, bronze polycarbonate. A button type photo control shall be provided

STATION INTERIOR LIGHTING

There shall be one or more forty eight (48) inch minimum length LED light fixtures installed within the equipment enclosure, as shown on the plan for this item. The fixture shall be 120/277VAC, 6000 lumens minimum with a medium distribution lens, 4K color temp, and be UL Listed for a wet environment. The light switch shall be of the night glow type and be located conveniently adjacent to the door.

Open fixtures will not be accepted.

HEATING/COOLING UNIT

The unit shall be two-piece, wall-mounted, factory-assembled, pre-charged, prewired, tested and ready-to-operate mini split heat pump system. The unit shall have a limited warranty of 10-years on parts. One (1) each exterior wall mounted compressor, hard-wired as shown;

1. One (1) each interior wall mounted air handler. Hard wired as shown;
2. Remote adjustable thermostat;
3. Refrigerant: 410A (HFC);
4. Minimum EER Rating: 9.10
5. 1.5 Ton Cooling capacity

DEHUMIDIFIERS

1. One (1) each, installed as shown.
2. Capacity 30 pints per 24 hours.
3. Compressor rated 115 volts, 60 Hz, 4.3 operating amps.
4. 106 CFM fan, 2 fan speed.
5. Humidity range 35 to 80% RH, ambient temperature range of 41 to 95 F, Type R410A refrigerant.
6. Washable filter.
7. Condensate piped direct to drain.
8. UL listed rubber cord.

DIVISION 17
TELEMETRY



SECTION 17000

INSTRUMENTATION AND CONTROL SYSTEM AND SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) – TELEMETRY SYSTEM

1.0 PART 1 - PROJECT DESCRIPTION

1.01. Description

A) Description of Work

The work to be accomplished under this section shall consist of furnishing the equipment necessary for a complete control system to function as specified herein and as shown on the drawings.

B) Scope of Work

The Contractor shall furnish and install all materials, labor, tools, equipment, supplies and services required to furnish and/or modify the existing system for a complete, stand alone INSTRUMENT & CONTROL/SUPERVISORY CONTROL AND DATA ACQUISITION (I&C/SCADA) system. This system includes **a new RTU at the US 60 pump station and the Office pump station** so that it will interact with the main unit at the Rowan Water, Inc. office. The current SCADA system used by Rowan Water, Inc. is Micro-Comm, Olathe, KS.

C) System Integrator Shall Supply:

- 1) Shop drawings prior to installation.
- 2) All the paper works and fees necessary to obtain a license in the name of the Owner.
- 3) All labor for installation and start-up of the system.
- 4) All equipment required by schedule.
- 5) All ancillary equipment, hardware, software, and appurtenances needed for proper installation and operation of equipment.
- 6) Provide spare parts and maintenance tools as described below.
- 7) Operations and maintenance manuals as detailed below.
- 8) 120VAC power at all sites.
- 9) Pressure sensing taps for all sensing points in the system.
- 10) Meter pits for sensing tank levels or line pressures in the system

D) Owner Shall Supply:

- 1) Access and easements as needed for all sites.

1.02. Quality Assurance

A) Manufacturer's Qualifications

The system specified herein shall be the product of a manufacturer who can demonstrate at least ten (10) years of satisfactory experience in furnishing and installing comparable radio telemetry/control systems for water and wastewater installations.

The manufacturer of this system shall maintain a 24-hour available inventory of all replaceable modules to assure the Owner of prompt maintenance service and a single source of responsibility. The manufacturer shall certify this to the Engineer in writing at the time of bidder pre-qualification.

B) Prebid Approval

All "unapproved" manufactures are required to submit a prebid submittal (14) days prior to the bid date. Submissions that fail to include a complete submittal as detailed shall

be deemed unresponsive. The Consulting Engineer and the Owner shall be the sole judge as to whether the alternate equipment is considered an approved equal. Approval of an alternate system by the Engineer will not relieve the alternate system of strict adherence to these specifications. The prebid submittal shall include the following:

- 1) Block diagrams for the various sites in the proposed system,
- 2) Sample electrical drawings for typical sites
- 3) A product performance data sheet shall be included for each proposed component in the system (i.e. antennas, radios, coaxial cables & arrestors, remote unit equipment, central terminal unit equipment, power supplies, time delays and relays, and the various sensors required).
- 4) Radio path study for each radio path in the system.
- 5) An installation list with the names and phone numbers of both the Owner and Consulting Engineer for at least ten projects of similar size and complexity.
- 6) A "statement of compliance" detailing paragraph by paragraph his compliance or exceptions to these specifications.

Bidders shall satisfy themselves that the necessary radio frequency can be obtained. The radio path study provided by each bidder shall utilize either:

- a) Computer generated techniques utilizing USGS terrain information to plot the path profiles for each radio path with elevation samples not more that 2000-foot increments.
- b) Actual field measurements to determine the necessary antenna heights, transmitter power, and antenna gains required to insure a 20db fade margin as detailed in Section 2.02 of these specifications.

The a physical path analysis shall be made using temporary equipment installations and an IFR 1000 or equal equipment to measure actual path margins. The bidder shall include in his bid, all the calculations used to extrapolate the measured data. The bidder is expected to obtain the necessary temporary FCC license for the study.

C) Codes & Standards

The control system and its components shall comply will all applicable requirements of the following:

- 1) Electrical Code Compliance (National & Local)
- 2) NEMA Compliance
- 3) IEEE Compliance
- 4) EIA Compliance
- 5) FCC Compliance

D) System Integrator

The equipment shall be as supplied by Micro-Comm, Inc of Olathe, Kansas. This is the equipment now used by the district throughout their entire system.

1.03. Submittals:

Complete submittal shall be provided to the engineer for approval prior to equipment fabrication. The submittal data shall include the following:

A) Product Data

Provide product data sheets for each instrument and component supplied in the system. The data sheets shall show the component name as used on reference drawings, manufacturer's model number or other product designator, input and output

characteristics, scale or ranges selected, electrical or mechanical requirements, and materials compatibility.

- B) Shop Drawings**
Provide drawings for each panel showing the wiring diagrams for control circuits and interconnections of all components. The drawings shall include wiring diagrams for all remote devices connected to the panel.
- C) Panel Layout Drawings**
A front panel and sub-panel layout shall be included as part of each control panel drawing. Components shall be clearly labeled on the drawing.
- D) Installation Drawings**
Typical installation drawings applicable to each site in the system shall be included.

1.04. Maintenance Information

- A) Maintenance Data Manuals**
Submit maintenance manuals and "as built" drawings on all items supplied with the system. The manuals and drawings are to be bound into one or more books as needed. In addition to "as built" engineering submittal data and drawings, the manual shall include:
 - 1) Trouble Shooting Guides.
 - 2) Maintenance and calibration data for all adjustable items.

1.05. Job Conditions

All instruments and equipment shall be designed to operate under the environmental conditions where they are to perform their service. The equipment shall be designed to handle lightning and transient voltages as normal environmental hazards. The environmental conditions are as follows:

- A) Outdoor**
The equipment will be exposed to direct sunlight, dust, rain, snow, ambient temperatures from -20 to +120 degrees F, relative humidity of 10 to 100 percent, and other natural outdoor conditions. The installations shall be hardened to with stand normal vandalism.
- B) Indoor**
The equipment will be capable of operating in ambient temperatures of +32 to +130 degrees F and relative humidity of 20 to 100 percent.

1.06. Delivery, Storage, & Handling

All items shall be stored in a dry sheltered place, not exposed to the outside elements, until ready for installation. All items shall be handled with appropriate care to avoid damage during transport and installation.

1.07. Sequencing & Scheduling

- A) Coordination**
The Systems Integrator shall coordinate with other electrical and mechanical work including wires/cables, raceways, electrical boxes and fittings, controls supplied by others, and existing controls, to properly interface installation and commissioning of the control system.
- B) Sequence**

Sequence installation and start-up work with other trades to minimize downtime and to minimize the possibility of damage and soiling during the remainder of the construction period.

2.0 PART 2 - PRODUCTS

2.01. Distributed Control Operation Description

A) General

The control system shall use "smart-programmable" Remote Terminal Units (RTUs) to provide a "distributed intelligence" type control system. The software programs used at all locations shall be stored in non-volatile EEPROM or Flash type memories that are field re-programmable using software detailed later in these specifications. The system shall be "self-initializing" and not require operator intervention after power interruptions, transients from lightning storms, or component changes. All units in the system shall include "watch-dog" circuitry to insure automatic restarts of the system. Each remote site in the system shall be assigned a unique digital address.

The control system shall support peer-to-peer (i.e. RTU to RTU) communications to provide completely automatic control. In the event a Central Unit is not in operation, the RTUs shall be capable of operation without software or hardware modifications. Each Water Tower remote shall be able to automatically communicate with its respective Booster Pump Station remotes with level data and discrete data. Each pump station remote shall be able to generate its own pump stop/start commands to maintain its water tower's level. All sites in the system shall have a "Telemetry Control" lamp to indicate that the site is functioning normally and in communication with the Central Unit or its respective water tower.

2.02. VHF (154-173 MHz) Radio Channel Data Operation

A) General

The control system shall be specifically designed for radio channel data communications. All of the equipment required for operation of the system shall be directly owned by the Owner and included as part of this contract. Systems using third party repeaters, trunking masters, or leased equipment will not be allowed.

B) Communications

The control system shall operate in a half-duplex mode over a single VHF (154 - 173MHz) radio frequency using "point-to-point" communication techniques. The RTUs shall monitor for the channel to avoid data collisions with other RTUs during peer-to-peer communications. The system shall be capable of sharing the radio channel with other radio telemetry system. .

All data transmitted shall be in digital word form using FSK (frequency shift keying) transmission. All transmissions shall include the address of the sender and the receiver, and be subject to check sum, parity, and framing error checks, to insure a minimum data reliability of 1 error in 1,000,000,000 bits. Any transmissions that fail the data checking will be retried until correct. No data correction methods will be allowed. A plug-in RS232C data port shall be provided at all locations in the system to allow the use of a standard data terminal to view data exchanges between the sites and to provide a means of extensive de-bugging.

The system shall provide a complete data update at least once every (2) minutes with some functions updating faster as required by local system conditions.

C) Radio Channel Operation

The system shall be capable of operation on the narrow band splinter frequencies of the Private Land Mobile Radio Services within the Federal Communications Commissions (FCC) rules and regulations regarding these telemetry channels. The manufacture shall guarantee operation under co-channel conditions with other radio systems without interference to this system. FSK tones, data baud rates, transmitter output power, transmitter deviation, antenna gain, and antenna height shall be chosen to comply with the FCC requirements Part 90 - Subpart 90.35 and 90.238 for the Industrial/Business frequency pools. The radio system shall specifically meet the operating requirement that the sum of the highest FSK frequency and the amount of deviation shall not exceed 1.7 kHz for 3F2 emission (or 2.8 kHz for 6F2 emission) as detailed by the FCC for the specific frequency assigned.

The overall system design and operation shall provide a 20db pad over the minimum required for operation on all primary data paths (primary paths may include data relays) to insure a 98% reliability of communications. Remote sites required to support peer-to-peer back-up control shall provide 30db of pad to insure operation under all weather conditions and provide a 99.9% communications reliability. The 20db and 30db pad requirements and FCC rule compliance shall be demonstrated (at no additional cost) to the Engineer at his request. The testing shall be accomplished using an IFR AM/FM 1000S communications analyzer or equal equipment.

D) FCC Licensing

The system manufacturer/supplier shall be responsible for collecting all information, generating all paper work, and paying all fees required obtaining a license on behalf of the Owner.

2.03. Radio Transceivers & Accessories**A) General**

The radio transceivers shall be standard "un-modified" mobile two-way that can be tuned, aligned, and repaired at any two-way radio shop. Interface to external data modems shall be through the front panel microphone jack. The radios shall be synthesized and fully field programmable and include a built-in time-out timer to disable the transmitter after 0-60seconds. The units shall be tuned to FCC specifications for the specific frequency assigned. The radio equipment shall be FCC type approved and the system capable of operation on the narrow band splinter frequencies (154 or 173MHz) in the Industrial/Business radio service.

B) VHF Radio Transceiver (154Mhz or 173Mhz)

The system manufacturer shall supply a 5-watt VHF radio transceiver to insure a high level of quality and reliability. The radios shall be adjustable to 4 watts output power as may be required by the FCC for ERP (Effective Radiated Power) restrictions. All connections to the radio shall be plug-in. The VHF radio transceiver shall have the following specifications:

Transmitter:

RF output power	5 watts minimum (adjustable to 4)
Spurs & Harmonics	16 dBm (25uW) (or -50dBc)
Frequency stability	±0.00025% (-30 to +60 degrees C)
Emission	6F2 (2.5kHz DEV max) or 3F2 (1.2kHz DEV max)
FM hum and noise	-40 dB

Receiver:

Sensitivity	.35uV @ 12 dB SINAD (.5uV @ 20db quieting)
Selectivity	-65 dB
Spurious image rejection	-50 dB

Intermodulation	-65 dB
Frequency stability	$\pm 0.00025\%$ (-30 to +60 degrees C)
Receive bandwidth	*6kHz (or 3kHz) as required to match the transmitter

* The receiver bandwidth shall be reduced to match the transmit bandwidth of the transmitter and provide a minimum adjacent channel rejection of -50db.

The radio transceivers shall be Motorola Radius SM50-M33 or DTS.

C) Antenna & Coaxial Cable

The radio antennas at all locations shall be a five element Yagi, constructed with 3/8" diameter aluminum rod elements and 1-1/16" diameter aluminum pipe element support with a type N coaxial connector. The antenna shall have a minimum 8.0db forward gain with a 20.0db front-to-back ratio. The antenna shall be wind rated for a 100-MPH wind speed. The VHF antennas shall be MC-Yagi, Decibel Products DB292, or Celwave PD390S. The UHF antennas shall be MC-Yagi or Celwave PD688S.

Antennas shall be cabled to the transmitter enclosure connection by a RG/8U low loss (less than 1.8db per 100ft @ 100MHz) coaxial cable with cellular polyethylene (foam) dielectric. The coaxial cable shall have a braided copper shield coverage of 97% and a long life weather resistant polyvinyl chloride jacket. The antenna coaxial cable connection shall be a constant impedance weatherproof Type N connector, taped with a weather resistant electrical tape to insure a lifetime watertight assembly. The coaxial cable shall be Belden 8214 or Amphenol TWB 4001 cable.

D) Antenna Lightning Protection

Coaxial connection to remote and central unit enclosures shall be by means of a coaxial type bulkhead lightning arrestor. The units shall be rated at 1 kilowatt with a minimum 500V and maximum 2000V-breakdown voltage. Coaxial lightning arrestors shall be a PD-593 or PolyPhaser IS-B50LN-C1.

E) Antenna Mounting Systems

Antennas shall be mounted at a height above ground that is consistent with FCC rules and regulations and provides adequate signal fade margin as described earlier. Antennas must be a minimum of 15 feet above ground and mounted as follows:

- 1) **Water Towers:** The antenna shall be mounted on the ladder or the water tower catwalk railing at a height consistent with FCC requirements. The coaxial cable shall be secured to the ladder or obstruction lighting conduit. A 3/4" rigid conduit with a weather-head shall be provided from the transmitter to the ladder on the tower.
- 2) **Antenna Tower at the Pump Station:** A bracketed antenna tower shall be supplied at the booster pump station location. The tower shall be assembled from 10' sections built on a 18" equilateral triangle design. Tower sections shall be constructed of 1-1/4" steel tubing with continuous solid steel rod "zigzag" cross bracing electrically welded to the tubing. The entire 10' sections shall be Hot-Dip Galvanized after fabrication for long life. The antenna tower shall be a 50' in height or at an adequate height to provide reliable communication.

2.04. Instrumentation & Accessories

A) General

All items in the control system (electronic cards, power supplies, radios, time delays, relays, etc.) shall be of plug-in construction, make use of a plug-in wiring harness, use plug-in terminal blocks, and be interchangeable without recalibration. To insure field repair-ability by non-technical personnel, equipment that must be un-wired for

replacement will not be accepted.

The following instrumentation devices and techniques shall be used as specifically called for in the RTU input/output sections of this specification.

B) Power Supplies

The DC power supplies shall provide $\pm 0.1\%$ line and load regulation with $\pm 10\%$ input variations. They shall have a temperature coefficient of $\pm 0.02\%$ per degree C. The input/output isolation shall be 100 Mohms DC (900Volts AC) with output transient response of 50 microseconds maximum. The power supplies shall be sized to operate the remote unit equipment with or without the back-up battery in place. Power Supplies shall be a Power One Series MAP130, Sola SLS.

C) Battery Back-up Operation

The remote units indicated shall be supplied with battery back-up operation. The rechargeable batteries shall be the sealed solid gelled electrolyte types, designed for float or standby service. Unless noted otherwise in the RTU descriptions, batteries shall be sized to maintain 24-hour service at water tower remotes and 8 hour service at booster pump stations and other remotes. The remote shall include a charging module to recharge the battery when power is resumed, maintain the charge between outages, and provide a low voltage cut-off to protect the battery from excessive discharge during prolonged outages. All discrete, analog, and pulse inputs (i.e. switch closures, pressure, level, flows, etc.) shall continue to function on battery back up. Batteries shall be Globe Gel/Cell .

D) Single Phase 120VAC Power Line Lightning Protection

Every site in the system shall be equipped with AC line filtering and lightning protection. The equipment shall provide 2-stage lightning/transient protection including inductive and capacitive filtering and MOV over-voltage protection.

E) Time Delays & Relays

All hardware time delays used in the system shall be of plug-in construction with DIN rail mounted sockets and have pilot duty contacts rated for 3 amps resistive @ 240VAC (or 0.8 amps inductive) loads. The time delays shall have switch selectable ranges from .1-1c, .2-10, 1.2-60, and 12-600 seconds. The time delays shall provide a $\pm 0.2\%$ repeat accuracy. The time delays shall have both "timing" and "timed" LED indicators. Time delays and relays shall be IDEC series GT5Y and RY4S .

F) Level & Pressure Transducers

Level & pressure transducers shall be of the all solid-state two-wire transmitter type with a 4-20mA output from a 10.5-24VDC excitation. The units shall be powered from the RTU power supply. The transducers shall have a combined error (linearity and hysteresis) of $\pm 0.25\%$ full scale and be temperature compensated to $\pm 2.5\%$ per 100 degrees Fahrenheit. Zero and span adjustments shall be standardized so that transducers are interchangeable without recalibration. All exposed or wetted parts shall be series 316 stainless steel, PVC, or Buna-N. The units shall be capable of a three times full scale over pressure with out damage or change of calibration.

The transducers shall be mounted at the sensing point and wired to the enclosure. The transducers shall have a 1/4" or 1/2" NPT process pressure connection. Transducers for above ground mounting shall have a 1/2" conduit connection for cable entry. Transducers at water towers (and other outside locations) shall be mounted below grade and below frost line to prevent freezing. Below grade mounted units shall have factory signal cabling and be suitable for a minimum of 100' submerged duty.

Level transducers for clear-wells and wetwells shall be suspended in the clearwell or wetwell and supplied with sufficient factory installed cable to access a "clean/dry area" junction box. The suspension cable shall have a polyethylene jacket and internal

venting to provide for atmospheric sensing of the non-process side of the diaphragm. The sensors shall have a multi-ported pressure-sensing end that protects the diaphragm while sensing the level of viscous liquids or slurries. The cable connection in wet-well applications shall have a non-fouling guard to prevent build up of foreign materials.

Pressure/Level transducers shall be Micro-Comm L5N series, Consolidated A300 Model 221GEE, or Ametek Model 57S.

G) Entry Alarm

Unauthorized entry alarms at remote sites shall be accomplished through a perimeter alarm system powered from the common 12VDC-power supply. The system shall include the necessary structure entrance magnetic door switches. Should an intruder enter the structure without acknowledging his presence, an entry alarm will be sent to the Central Unit. The entry alarm shall have an adjustable time delay (0-60 seconds) to allow authorized personnel time to acknowledge their presence when entering the structure and provide a re-arming delay when leaving the structure. The RTU door mounted key switch shall be constructed so that the key can only be removed in the "armed" position. The alarm system shall be Micro-Comm SEAS series, Tandy Safe House 49-450.

3.0 PART 3 - REMOTE TERMINAL UNIT EQUIPMENT

1. General

The Remote Terminal Units (RTUs) shall be "smart" Programmable Logic Control units at all locations. The core software program used at all locations shall be identical and stored in non-volatile FLASH type ROM memories that can be upgraded in the field by the owner using configuration software supplied as part of this contract. The core RTU software shall provide the basic operational logic including communication with other sites in the system. In the event a CTU is added the RTUs shall respond to control commands from the CTU, and provide back-up peer-to-peer control in the event of a CTU failure.

Program and configuration data shall normally be stored in battery-back or flash type memory for use by the CPU. In addition, this data shall also be stored in a plug-in operator interchangeable EEPROM memory module. This module shall be fully enclosed with no exposed electrical leads, similar to the Allen-Bradley M11 memory module, providing protection against damage due to handling and static electricity. The module shall be programmed via the CPU and without the use of external adapters. The RTUs shall include "watch-dog" circuitry and be "self-initializing" without operator intervention. In the event that the program or configuration data is corrupted, the CPU shall reload the program and configuration data from the EEPROM memory module.

The RTUs shall be fully online programmable while the RTU continues to communicate with the rest of the system and performs its assigned control tasks. The RTUs shall support "fill-in-the-blank" type configuration for basic operation and to set-up common features such as COM port set-up, peer-to-peer data collections, local back-up control set points, input and output setup, output on/off time delay settings, front panel display setup, etc. The RTU shall also support a process script language or ladder logic type programming for site-specific customizations including special input and output manipulations, local sequential control, and math functions. The RTU shall support both mathematical and PID control algorithms. Both the fill-in-the-blank configuration and programming shall be stored in the operator removable program module.

The supplier shall provide a licensed copy of the RTU configuration and programming software along with the necessary communications cables to the owner. The software shall be Windows 95/98/NT compatible. Training on the use of the software shall be

provided as part of the system training.

2. Construction

The RTU shall use modular construction. The base unit shall be composed of the power supply, CPU, communications modules, and basic inputs and outputs. The unit shall have expandable inputs and outputs via either a card rack design or integrated high-performance serial I/O bus. All terminations on the RTU or expanded I/O shall use removable, NEMA-style "finger-safe" terminal blocks on the controller and I/O.

The RTU shall be capable of being powered from AC, DC, or solar sources. DC and solar powered RTUs shall have an integral battery charging circuit that protects the external battery from over and under voltage conditions and provides automatic charging of the battery after power failures. The back-up power supply shall provide for the necessary 12VDC to run the radio and 24VDC to power external sensors while on battery power or recharging. Back-up batteries shall be rechargeable sealed lead-acid type batteries as manufactured by PowerSonic or equal. The back-up battery shall provide for 24 hours of back-up operation at water tower remote units and 3 hours at all other sites.

The RTU shall support multiple communications ports. The first shall be used primarily for CTU-RTU and RTU-RTU communications. It shall support baud rates of 110-9600 baud and have a plug-in standard 25 pin sub-D connector that provides both full RS232 interface and radio modem interface for use with either "data" radios or standard business band type radios (i.e. radios with out internal modems). This port shall also have a 9 pin sub-D connector to allow monitoring of the communications activity. The second communications port shall provide for multi-drop type communications with operator interfaces, external inputs and outputs (I/O), and programming terminals. The port shall provide for both 2 and 4 wire RS485 interface with data rates to 9600 baud. The communications ports shall include LED's to show the status of all control lines.

The RTU shall provide for sufficient installed and configured spare inputs and outputs (I/O) to meet the site requirements as detailed and provide for 25% spares of each type. The unit shall have a minimum of 8 discrete inputs (DI), (4) analog inputs (AI), and (1) high speed pulse input (PI). The analog and pulse inputs shall provide for sensor excitation with separate fuses for each input. The fuses may be the self-resetting type. The RTU inputs, outputs, and operator interface shall be as follows:

- 1) **Discrete Outputs** - The discrete outputs shall be isolated relay outputs rated at 5.0A continuous @ 240VAC. LEDs on the front of the RTU base unit or expansion module shall indicate the status of each output point. Interposing relays shall be provided if the voltage or current of the external load on a contact exceed the 5.0A 240VAC ratings. Each output shall be provided with operator settable software ON and OFF time delays
- 2) **Discrete Inputs** - The discrete inputs shall be optically isolated and provide for 24VDC excitation to remote sensors and switches. LEDs on the front of the input module shall indicate the status of each input point.
- 3) **Analog Inputs** - The analog inputs shall provide filtered and scalable analog to digital conversion of input signals. The analog inputs shall be switch selectable from 0-5VDC to 0-20mADC and provide a minimum of 0.3% resolution and 0.5% accuracy over the temperature range of 0-70degrees C. The RTU shall provide separately fused 24VDC excitations to the remote sensors.
- 4) **Analog Outputs** - The analog inputs shall provide a 0-5VDC signal to RTU panel mounted devices or 4-20mA isolated signals if sent to other panels as specified.
- 5) **Pulse Inputs** - The high-speed counter/pulse inputs shall provide for pulse rates up

to 1KHz direct from flow meter transmitter heads without interposing equipment. The pulse input shall include fused 12VDC excitation to the meter transmitter.

- 6) **Power Supply** - Each RTU assembly shall include an integral power supply. Power supplies shall be designed for 12VDC or 24VDC input power and suitable for use in battery back-up operations.
- 7) **Keypad & Display Unit** - The optional keypad & display unit shall have a 4x20 back-lighted LCD display to display the status of all local inputs and the tank level of the associated control water tower level. The 5x5 keypad shall provide for operator input of set points and timer settings. The operator interface shall be menu driven and provide for dedicated keys for cursor position and input functions. The operator interface shall provide for up to 50 screens of data display. The keypad & display unit shall be supplied and mounted on the front of the RTU enclosure if detailed in the specific RTU I/O requirement list. The keypad & display unit shall maintain the Nema 4 rating of the RTU enclosure.

3. Enclosures

The remote unit enclosures for indoor mounting shall meet all the requirements for NEMA Type 12 enclosures. The enclosures body shall be made of a minimum 14 gauge steel with continuously welded seams and be furnished with external mounting feet. The enclosure door shall be made of a minimum 16 gauge steel with have a 14 gauge steel hinge. Enclosures larger than 16x14 shall have a rolled lip on 3 sides of the door for added strength. The door opening shall have a rolled edge on 4 sides to protect the door gasket. The door gasket shall be heavy neoprene and attached to the door with oil resistant adhesive. Sub-panels shall be 14-gauge steel for 16x14 enclosures and 12 gauge for larger enclosures. The enclosure finish shall be gray polyester powder coating inside and out over phosphatized surfaces. The subpanels shall be finished in white. Nema 12 enclosures shall be Hoffman "CH" or "CONCEPT" wall mount enclosures.

Remote site installations requiring equipment to be mounted outside shall have a double box enclosure with the remote unit enclosure mounted inside a lockable NEMA 3R enclosure. The double enclosure shall be required to control vandalism, provide complete weather protection, reduce the heating effects of the sun, and prolong the life of the equipment. The NEMA 3R enclosure shall be constructed of 14 gauge galvanized steel, with a drip shield top and seems free sides front and back, and a stainless steel hinge pin. The enclosure finish shall be gray polyester powder coating inside and out over phosphatized surfaces. The NEMA 3R enclosure shall be Hoffman Bulletin A-3.

The remote unit enclosures mounted in damp corrosive areas (such as concrete meter vaults) shall be NEMA Type 4X rated enclosures. The enclosures shall be made of molded fiberglass polyester and be furnished with external mounting feet. The door shall have a seamless foam-in-place gasket and corrosion-resistant hinge pin and bails. Sub-panels shall be 14-gauge steel for 16x14 enclosures and 12 gauge for larger enclosures. The enclosure finish shall be a light gray inside and out. The subpanels shall be finished in white. Nema 4X enclosures shall be Hoffman "Fiberglass Hinged Cover".

4. Local Control Functions

In general the RTU's shall be programmed to provide generic control functions as detailed earlier and to work in concert with the CTU. The integrator shall be responsible to meet with the owner and the engineer to develop the automatic control strategy required for the system.

4.0 PART 4 - EXECUTION

4.01. System Start-up

The manufacturer shall supply "Factory" personnel for start-up service as needed to insure satisfactory operation. Subsequent trips to the job site to correct defects shall be made at no charge to the Owner during the warranty period.

4.02. Training

The system manufacturer shall supply "factory" personnel to conduct an on-site training session; a minimum of one day of training is required.

4.03. Substantial Completion

The Engineer will grant substantial completion only after completion of the start-up and initial training phase of the project. The Engineer shall make an inspection of the system to determine the status of completion. Substantial completion will be awarded only when the system is providing usable service to the Owner. If the system is commissioned in phases, the Contractor may request substantial completion for the completed phases.

4.04. BOOSTER PUMP STATION REQUIREMENTS:

A) Installation Requirements:

Telemetry Control and Pump Command outputs to other panels shall be dry isolated contacts on relays. Indicating lamps shall display the status of these outputs on the front of the enclosure.

Local pressure inputs shall be by two-wire transducers as specified with the transducer located at the sensing point. Flow rate and totalizing shall be as specified above.

The booster pump station equipment shall be housed in a NEMA 12 enclosure. The booster station equipment shall include an internal power switch, bulkhead coaxial cable lightning arrestor, and a power line lightning arrestor as specified earlier.

The antenna shall be mounted on a 50' Rohn tower as specified earlier.

B) CTU Communications Method:

The CTU shall communicate with these RTUs via VHF radio communications as detailed previously.

C) Front Panel Display Requirements:

- 1) Keypad & Display assembly to display all inputs and output status
- 2) Pump #1 CALL lamp
- 3) Pump #2 CALL lamp
- 4) Telemetry Control Active lamp
- 5) Central Control Active lamp
- 6) Pump #1 Fail lamp
- 7) Pump #2 Fail lamp

D) Discrete Outputs:

- 1) (1) System Normal (displayed on front of RTU assembly)
- 2) Pump #1 CALL
- 3) Pump #2 CALL
- 4) (spare)
- 5) (spare)
- 6) (spare)

E) Discrete Inputs:

- 1) Power Failure
- 2) Pump #1 RUNNING

- 3) Pump #2 RUNNING
- 4) Pump #1 Low Suction Pressure
- 5) Pump #2 Low Suction Pressure
- 6) Pump #1 High Discharge Pressure
- 7) Pump #2 High Discharge Pressure
- 8) Pump #1 Over Temp
- 9) Pump #2 Over Temp
- 10) Pump #1 VFD Failure
- 11) Pump #2 VFD Failure
- 12) Un-authorized Entry (new door switch)
- 13) – 20) spares

F) Analog Inputs:

- 1) Discharge Pressure (new pressure transmitter)
- 2) Suction Pressure (new pressure transmitter)
- 3) Spare
- 4) Spare
- 5) Spare
- 6) Spare

END OF SECTION

DIVISION 22
PLUMBING

SECTION 221126**IN-LINE CENTRIFUGAL DOMESTIC
WATER PUMPS AND MOTORS****PART 1 - GENERAL****1.01 WORK INCLUDED**

A. The Contractor shall furnish, set in place, conduct start-up procedures, and test all pumping units and their appurtenances as indicated on the Drawings and as herein specified. These specifications direct attention to certain features of the pumping units, but do not purport to cover all the details of their design. The equipment furnished shall be designed, constructed, and erected in conformity with accepted high-quality standards.

B. All pumps as indicated in this section of the work herein specified include:

1. Pump and Motor
2. Installation.
3. Supports, Anchors and Seals.
4. Concrete Pedestal and Grouting
5. Instrumentation
6. Controls
7. Electrical
8. Adjustment and Start-Up.

C. Pump Data:

1. Pump capacities and other operational data are indicated on the pump schedule included herein.
2. Insofar as possible, pumps of the same type shall be the product of one manufacturer.
3. Electrical controls and starting equipment not specified herein are specified under the appropriate electrical sections.
4. Pumping units shall be equipped with the necessary accessories, including lifting attachments, lubricators, and drainage connections.

D. All bidders must recognize that, if any alternate pumping system is used and does not meet or exceed the physical and dimensional standards nor perform as specified in the judgment of the project Engineer or Owner, the Contractor shall be required to modify or replace the alternate equipment with the original pumping equipment at no additional cost to the Owner or Engineer.

E. In order for alternate equipment to be considered an "approved equal," prospective suppliers must make a pre-bid submittal as detailed in the following paragraphs and make it available to

the design engineer seven (7) calendar days prior to the time of bidding. All differences shall be clearly marked between the specifications and proposed substitute equipment.

F. The pre-bid submittals for qualification to bid must contain an installation list of ten (10) similar in size and capacity completed and in operation within the past five (5) years. The installation list will be complete with the date of installation, the name and telephone number of the equipment operator and the name and telephone number of the design engineer.

1.02 RELATED WORK

- A. Division 1 - General Requirements.
- B. Division 26 - Electrical.
- C. Division 33 – Utilities
- D. Division 46 – Water-Wastewater Equipment

1.03 REFERENCES

The chemical and physical properties of all materials and the design, performance characteristics and methods of construction of all items of equipment shall be in accordance with the requirements of the latest issue of the various applicable Standard Specifications. These Standard Specifications have been prepared by authorities which are recognized by the Mechanical Trades. The names of these authorities are listed below together with the abbreviation of their names as they may appear in these Specifications:

- A. American National Standards Institute (ANSI). - ANSI B58.1(latest revision) -Deep Well Vertical Turbine Pumps.
- B. National Sanitation Foundation (NSF) / American National Standards Institute (ANSI) - Standard 61, Standard 61-G, Standard 372 for Drinking Water System Components
- C. American Water Works Association (AWWA).
- D. American Society for Testing and Materials (ASTM).
- E. National Fire Protection Association (NFPA).
- F. National Association of Fan Manufacturers (NAFM).
- G. American Society of Mechanical Engineers (ASME).
- H. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
- I. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

1.04 QUALITY ASSURANCE

A. Standards, codes, rules and regulations as established and listed herein, as amended, latest edition, govern the work.

B. The Pump Manufacturer shall provide a statement of certification or third party documentation of approvals such as National Sanitation Foundation (NSF), International Underwriters Laboratory (UL) or other acceptable ANSI accredited stating that all water contact materials are fully ANSI/NSF certified and meet the requirements of ANSI/NSF Standard 61, Standard 61-G, and Standard

372 for Drinking Water System Components for any treatment equipment and all materials that will be in contact with the water.

C. Factory Pump Tests:

1. The Contractor shall furnish sworn certificates to the effect that the pump casings have passed the hydrostatic pressure tests.
2. Pump tests shall be conducted on all pumps included in this specification section. During each test, the pump shall be run at all specified head conditions for a sufficient time to permit accurate determination of discharge, head, and power input. Certified copies of the test data shall be furnished to the Engineer for review. All tests shall be run in accordance with the Standards of the Hydraulic Institute.

D. Motor Tests: Each motor shall be given the standard commercial tests in the shop of the motor manufacturer, and certified copies of the tests results submitted to the Engineer for review prior to installation of the motors.

E. Field Acceptance Tests:

1. After installation of the pumping equipment, and after inspection, operation, testing and adjustment have been completed by the manufacturer's representative, each pump shall be given a running test in the presence of the Engineer during which it shall determine its ability to operate without vibration or overheating, and to deliver its rated capacity under the conditions. During the tests, observations shall be made of head, capacity, and motor input. All defects or defective equipment revealed by or noted during the tests shall be corrected or replaced promptly at the expense of the Contractor, and if necessary, the tests shall be repeated until results acceptable to the Engineer are obtained. The Contractor shall furnish all labor, piping, equipment, and materials necessary for conducting the tests.
2. All adjustments necessary to place the equipment in satisfactory working order shall be made at the time of the above tests.
3. If sufficient water is NOT available for the test, the Contractor shall provide water for testing.
4. In the event that the Contractor is unable to demonstrate to the satisfaction of the Engineer that the units will satisfactorily perform the service required and that they will operate free from vibration and heating, the pumping units may be rejected. The Contractor shall then remove and replace the equipment at his own expense.
5. The field verification and/or drawdown tests shall include measuring or determining the following items:
 - a. Flow rate.
 - b. Total head on the pump.
 - c. Power input.
 - d. Static head on the pump.
6. On those pumps or set of pumps that have a flowmeter in the discharge line, the flowmeter may be used to determine the pump flow rate once its accuracy has been verified in the field. The Contractor shall verify the accuracy of the raw water flowmeters. These flowmeters shall be calibrated as necessary for acceptable meter accuracy.

- a. Drawdown Test:
- (1) The drawdown/fill test involves measuring the flow rate in the field and comparing it to the meter measurement. The meter shall not be accepted until the results of the tests indicate the meter is measuring within its stated accuracy. The meter shall be tested over the expected range of flow in which it will operate during normal operation; however, the Engineer will select no more than five (5) flow rates at which the meter accuracy is to be tested. At each flow rate, the meter test shall be of a minimum ten (10) minute duration unless the capacity of the basin being used in the testing will not allow that time period.
 - (2) Prior to the test, the volume of the basin being used to determine the drawdown of fill shall be measured for liquid volume per unit of height.
 - (3) In the event the meter does not perform within its stated accuracy, the Contractor shall either postpone the pump tests until an accurate meter is obtained or proceed with the tests using the drawdown/fill methodology for measuring flow rate.
- b. Field Testing:
- (1) All field measurements for pump rate shall be made within + 0.01 feet. Readings on all instruments shall be made at two (2) minute intervals for readings shall be averaged to calculate the power draw of the motor, the actual flow pumped, and the static and total dynamic head on the pumps.
 - (2) The Contractor shall submit and receive approval on a pump and meter field test rate form from the Engineer prior to any field tests being conducted.

F. There shall be no significant change in vibration and noise level per the Hydraulic Institute standards over the entire listed range of flow for the pumping system. The Contractor shall provide the services of a qualified third-party vibration consultant to measure critical frequencies of the installed equipment and measure total vibration over the entire listed range of flow of all of the VFD pumping units. The results shall be furnished to the Engineer in accordance with shop drawing requirements.

1.05 PERMITS AND CODES

A. Contractor shall obtain and pay for all permits and inspections from legally authorized agencies governing such work.

B. Installation shall be in accordance with all applicable codes and regulations. A partial list includes:

1. City and/or County Building Inspector.
2. National Board of Fire Underwriters.
3. State Division of Water.
4. State Plumbing Code.
5. Standards and Safety.
6. State Department of Public Safety.

C. Check with the Engineer to be sure the installation work is being constructed in accordance with Plans and Specifications which have been approved in their entirety and/or which reflect any changes requested by the State Division of Water. Furnish three (3) copies of all inspection certificates obtained, including the State Department of Health certification, when work is completed.

1.06 TEMPORARY SERVICES

A. The equipment when installed may require the use of temporary heating and electrical services, subject to an agreement between the Owner and the Contractor, and with the consent of the Engineer. Should the permanent systems be used for this purpose, the Contractor shall pay for all temporary connections required and all replacements, without cost to the Owner, leaving same in "as new" condition.

B. Permission to use the permanent equipment does not relieve the Contractor from the responsibility for damage to the building construction and/or equipment which might result because of its use.

1.07 SUBMITTALS

A. In addition to submittal requirements specified in Section 01300, the Contractor shall submit the following:

B. Provide a statement of certification or third party documentation of approvals stating that all water contact materials are fully ANSI/NSF certified and meet the requirements of ANSI/NSF Standard 61, Standard 61-G, and Standard 372 for Drinking Water System Components for any treatment equipment and all materials that will be in contact with the water for the pump used in this application.

C. Detailed shop drawings for all equipment and where applicable color and finish of each.

D. Submission of certified shop and erection drawings and data regarding pump and motor characteristics and performance. The data shall include certified performance curves based on actual shop tests of pumping units, which show that the units meet the specified requirements for head, capacity, efficiency, and horsepower for the various capacities specified. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations between Drawings, Specifications, and/or equipment to be provided. Curves shall be submitted on 8-1/2" by 11" sheets. Serial numbers for each unit shall be listed on the curve sheet. Shop drawings for accessory equipment shall also be submitted. Shop drawings for electrical equipment and systems furnished herein shall be provided as specified under Electrical Work.

1. Foundations, installation, and grouting.
2. Services of the manufacturer's representative.
3. Operating and maintenance instructions and parts lists.
4. Lubricants.
5. Special tools.
6. Bolts, anchor bolts and nuts.
7. Electric motors.
8. Voltage rating of motors.
9. Equipment drive guards.
10. Nameplates.
11. Capacitors for motors.

E. Submit two (2) copies of welding procedure specifications to the Engineer together with proof of qualification as outlined and required by most recent issue of Code having jurisdiction before any welding is performed. Also, submit two (2) copies of all operator's qualification record in conformance with provisions of Code having jurisdiction. Record shall show that operator was tested under proven procedure specifications submitted. One copy of the above shall be given to the resident project representative to be

kept on file at the job site. Standard procedure specifications and welders qualified by National Certified Pipe Welding Bureau shall be considered as conforming to requirements.

F. Shop drawings, descriptive literature, and schedules on:

1. Accessory Equipment.
2. General Specialties.
3. Water Supply Specialties.
4. Drainage Specialties.
5. Insulation.
6. Valves.
7. Controls.
8. Instrumentation.
9. Piping.
10. Electrical.

1.08 TOOLS AND SPARE PARTS

A. One (1) set of all special tools required for normal operation and maintenance shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

B. The manufacturers of the equipment specified herein shall furnish a complete set of recommended spare parts necessary for the first five (5) years of operation- of the pumping system. Additional spare parts to be furnished where required, are listed in the respective paragraphs of PART 2 PRODUCTS. The pump manufacturer shall provide at a minimum one (1) spare complete mechanical seal kit as required by the manufacturer.

C. Spare parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long term storage.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Contractor shall furnish, set in place, conduct start-up procedures and test two (2) booster pump station pumps along with all appurtenances as indicated on the Drawings and as specified herein. The discharge piping, electrical connection, and valves shall be furnished by the Contractor. These specifications direct attention to certain features of the pumping unit, but not purport to cover all the details of their design. The equipment furnished shall be designed, constructed, and installed in conformity with accepted high-quality standards.

B. Submittals: In addition to the requirements of Part 1.07 of this Section the contractor shall submit the following information in shop drawings to the Engineer for review:

1. Pump Data:
 - a. Rated Capacity, in GPM.
 - b. Rated Head (including column friction), in feet.
 - c. Speed, in RPM.
 - d. Pump Efficiency (including shaft and column friction losses) at rated capacity, in percent.
 - e. Pump Horsepower (including shaft and column friction losses) at rated capacity, in Horsepower.

- f. Minimum Submergence Required Over Suction Inlet, feet.
- g. Total Pump Downthrust, in pounds.
- h. Impeller Shaft Diameter, in inches.
- i. Lineshaft Diameter, in inches.
- j. Column Pipe Diameter (nominal), in inches.
- k. Length of Column, in feet.
- l. Weight of Pump, in pounds.

2. Motor Data

- a. Manufacturer.
- b. Motor Rating, in horsepower.
- c. Full Load Speed, in RPM.
- d. Type.
- e. Type of Thrust Bearing.
- f. Downthrust Capacity, in pounds.
- g. Voltage.
- h. Cycles, in hertz.
- j. Phases, in number.
- k. Weight of Motor, in pounds.
- l. Weight of Pump and Motor, in pounds.

2.02 OPERATING CONDITIONS

- A. The pumps shall be capable of delivering the fluid medium at the following capacities and heads when operating at (SEE CHART BELOW) minimum suction pressure. The flow and head indicated shall be the total flow and head as measured on the discharge side of the pumps. The actual calculated losses (both friction and minor) shall be taken into consideration when formalizing the final performance curve of the pumps.

		Operating Conditions									
Pump Station Location	Min. Suction Pressure	Design		Maximum		Shut-off Head	RPM	HP	Voltage	Phase	Eff. @ Design
	PSI	GPM	TDH	GPM	TDH						
Minerva PS	30	285	140	220	155	167	3530	15	230/460	3	79

- B. The pump driver shall be a standard, A.C. induction motor, totally enclosed fan cooled (TEFC) construction, normal thrust type and shall be (SEE CHART ABOVE) nominal horsepower and suitable for (SEE CHART ABOVE) volt electrical service. The motor shall be inverter duty and premium efficiency for suitable use with variable frequency drive (VFD) unit.
- C. The pump motor shall be sized so that the nameplate horsepower rating, without consideration of the service factor, shall not be exceeded at any point along the pump performance profile. The pump motor shall be complete with a 1.15 service factor.

2.03 BOOSTER PUMPS - VERTICAL MULTI-STAGE CENTRIFUGAL TYPE

- A. The high service pumps employed shall be of the vertical centrifugal multi-stage type, maximum four (4) stages, designed specifically for low flow - high head operation. The pumps shall conform to the detailed specifications as set forth below.
- B. The pump suction/discharge chamber, pump head, motor stool and shaft coupling shall be constructed of ductile iron. The impellers shall be constructed of stainless steel, laser welded through the front and back shrouds to the impeller vanes for increased efficiency. The impellers shall be secured to the pump shaft by means of a split cone and nut design. The metallic rotating parts, chambers, and outer sleeve shall be stainless steel. Intermediate bearings shall be bronze or Graflon. The lower bearing shall be tungsten carbide, mounted in the suction/discharge base and replaceable. The lower shaft journal shall be tungsten carbide and replaceable. The pumps shall be equipped with a cartridge seal of Tungsten Carbide/Tungsten Carbide. The seal shall be replaceable without disassembling the pump. The seal shall be replaceable without removing the motor. Sleeve sealing shall be on O-ring design, allowing sleeve expansion and contraction without leaking. A motor bearing plate option shall be available to allow use of a motor with standard bearings. Connections shall be plate flanges, locked to the suction/discharge base with a stainless steel split ring. The plate flanges shall rotate to allow alignment of the mating flange bolts.
- C. The pumps shall be supplied with ductile iron flange mounted discharge head with a suction flange with 125 pounds ANSI drilling and a discharge flange with 125 pounds ANSI drilling. If the shut-off head plus static pressure exceeds the 250 psi, then the discharge head shall have 250 pounds ANSI drilling or as indicated on the drawings.

BOOSTER PUMPS SHALL BE GRUNDFOS SERIES CR-15-5 or ENGINEERED APPROVED EQUAL.

2.04 BOOSTER PUMP MOTORS AND VARIABLE FREQUENCY DRIVES

- A. The pump motor shall be sized to ensure the pump is non-overloading when operating on the specified pump curve. The motor shall be of the horsepower, voltage, phase, and cycle as shown on the drawings. Motor design shall be Totally Enclosed Fan Cooled (TEFC) with a NEMA C face design operating at a nominal 3550 rpm with a minimum service factor of 1.15. Lower motor bearings shall be adequately sized to insure long motor life. The motor shall be premium efficient for suitable use with variable frequency drive (VFD) unit.
- B. Motor efficiencies shall be Premium Efficient as stated in NEMA MG 1, 2011 Part 12, Table 12-12 for the motor enclosure, open or closed. Motor Service factor shall be 1.15 on the nameplate, reduced to 1.0 when used with variable frequency drives per NEMA MG 1 – 2011, Part 31.3.7.
- C. Motors shall be furnished with insulated bearings and/or coated bearings and bearing housing with shaft grounding ring kit to eliminate any form of stray current from causing electric fluting or pitting of the bearings.
- D. Contractor shall supply two Danfoss Variable Frequency Drives, Model VLT AQUA, NEMA 12 wall mounted, with integral disconnect, rated for 25 amps, interfacing with the existing control panel and new Grundfos Pumps. VFD's shall be capable of constant pressure control utilizing two Danfoss MBS3000, 0-200 psi, pressure transmitters. The VFD's shall also interface with a new pilot panel that will include necessary components for switching from telemetry control, to constant pressure control with a contact switch. This pilot panel shall also include a 24 hour timer for alternation of the pumps during constant pressure control. All wiring and conduit shall be per NEC requirements, and

work shall be performed by a licensed Master Electrician. This pump station must remain operational during this work.

2.05 PUMP/MOTOR VIBRATION ISOLATION PADS

- A. The pump/motor assembly shall be mounted to a fabricated steel base built specifically for the pump/motor to be mounted. Each mounting or attachment point shall be complete with a vibration isolation pad. The pad will be in two (2) parts, a 1/4" base layer followed by a 5/8" upper layer and be a nominal 2" x 2" square size for pump/motor combinations weighing up to 1500 pounds.

2.06 ELASTOMER PIPE CONNECTOR

- A. The inlet side of each booster pump shall include an elastomer connector to help isolate vibration and noise in the piping system. The elastomer connector shall be of single sphere design, constructed of neoprene and nylon with bias-ply tire reinforcing cord to provide a 225-psi working pressure rating to a minimum of 120° F. The elastomer connector shall pass through the plate steel flanges designed to grip the connector so the connector seals without gaskets when the flange bolts are drawn up.
- B. A control joint limiting pipe connector movement shall be supplied with each pipe connector.

2.07 COMPRESSION COUPLINGS

- A. The piping shall include a variety of compression type, flexible coupling to prevent binding and facilitate removal of associated equipment. These couplings are to be where shown on the plans. In lieu of a compression coupling, a flanged coupling adapter (FCA) may be used.
- B. Grooved fittings may not be used under any circumstance.
- C. All compression couplings or flanged coupling adapters (FCA), and flexible connectors/expansion joints shall include a minimum of two (2) zinc coated steel threaded rods across the joint with appropriate bolted restraining points.

2.08 SPARE PARTS

- A. The required spare parts for each pump shall be as recommended by the pump manufacturer in the O & M Manual and to include, at a minimum, the following parts, if not listed.
 - 1. Stack Kit
 - 2. Gasket Kit
 - 3. Mechanical Seals
 - 4. Wear Rings
 - 5. O-Rings
- B. All spare parts shall be packed in containers which are clearly marked and identified with indelible markings in accordance with Section 016000, Product Requirement.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the Manufacturer's instructions and recommendations in the locations shown on the Drawings. Installation shall include furnishing the required oil and/or grease for initial operation. The grades of oil and grease shall be in accordance with the Manufacturer's recommendations. Anchor bolts shall be set in accordance with the Manufacturer's recommendations.

B. The Contractor shall submit a certificate from the equipment manufacturer stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of each unit.

B. All exposed portions of the pumps and motors shall be shop primed and painted in accordance with Division 9.

3.02 INSPECTION AND TESTING

A. General

1. The equipment manufacturer shall furnish the services of a competent and experienced representative who has complete knowledge of proper operation and maintenance of the equipment to inspect the installed equipment, supervise the initial test run, and to provide instructions to the plant personnel. The first visit will be for checking and inspecting the equipment after it is installed. The second visit will be to operate and supervise the initial field test. At least two (2) days shall be allocated solely to the instruction of plant personnel in operation and maintenance of the equipment. This instruction period shall be scheduled at least ten days in advance with the Owner and shall take place prior to plant start-up and acceptance by the Owner. The final copies of operation and maintenance manuals specified in Section 01730: Operation and Maintenance Data must have been delivered to the Engineer prior to scheduling the instruction period with the Owner. With the permission of the Engineer, these services may be combined with those provided under Paragraph 1.03.C.

2. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.

3. The Contractor shall provide the services of a qualified third-party vibration consultant to measure critical frequencies of the installed equipment and measure total vibration of the units. The results shall be furnished to the Engineer in accordance with shop drawing requirements.

B. Pumps

1. After all pumps have been completely installed, and working under the direction of the Manufacturer, conduct in the presence of the Engineer, such tests as are necessary to indicate that the pumping system operates satisfactorily and generally meets the conditions of service specified. The factory witnessed tests are the basis of equipment efficiency demonstration, the field test shall demonstrate correct mechanical operation after pump start-up. Field tests shall include all pumps included under this section. Supply all labor, equipment and incidentals required to complete the field tests.

2. If the pump performance does not meet the Specifications, corrective measures shall be taken or pumps shall be removed and replaced with pumps which satisfy the conditions specified. A 24-hour operating period of the pumps will be required before acceptance.

3. Stainless steel pumping units shall show no signs of corrosion upon acceptance by the Owner.

C. Motors

1. The Contractor shall megger each motor winding before energizing the motor, and, if insulation resistance is found to be low, shall notify the Engineer and shall not energize the motor.

2. The Contractor shall check all motors for correct clearances and alignment and for correct lubrication in accordance with Manufacturer's instructions. The Contractor shall check direction of rotation of all motors and reverse connections if necessary.

3.03 START-UP AND INSTRUCTION

A. Manufacturer's Representative: Present at site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:

1. One (1) person-day for installation assistance and inspection.

2. One (2) person-day for functional and performance testing and completion of Manufacturer's Certificate or Proper Installation and pre-startup classroom or site training.

- END OF SECTION -

DIVISION 26

ELECTRICAL

SECTION 260500**BASIC ELECTRICAL REQUIREMENTS****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes: Basic administrative, procedural, and general requirements for electrical products and installation applicable to all Division 26 work.

1.2 RELATED DOCUMENTS

- A. Bidding Requirements, Contract Forms, and Conditions of the Contract (General and Supplementary Conditions) apply to all work of Division 26.
- B. Comply with Division 1 - General Requirements.
- C. All work under this Division shall be in accordance with the Contract Documents as defined in the General Conditions.

1.3 SCOPE OF WORK

- A. Provide all labor, materials, tools, equipment, transportation, and services necessary for and incidental to completion of all electrical work as indicated on the Drawings and/or as specified herein.

1.4 DRAWING USE AND INTERPRETATION

- A. The Drawings are diagrammatic and indicate the general arrangement of systems and equipment unless indicated otherwise by dimensions or details. Install work substantially as indicated. Exact equipment locations and raceway routing, etc. shall be governed by actual field conditions and/or instructions of the Engineer and/or Owner's Representative.

1.5 COMPLETE SYSTEMS

- A. General: Furnish and install all materials as required for complete systems including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted, and demonstrated to be ready for operation prior to Owner's acceptance.
- B. Wiring: The wiring specified and/or shown on the Drawings is for complete and workable systems. Any deviations from the wiring shown due to a particular manufacturer's or subcontractor's requirements shall be made at no cost to either the Contract or the Owner.

1.6 CODES AND REGULATIONS

- A. General: Comply with the National Electrical Code (NEC) and all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

- B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities.
- C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.7 REFERENCE STANDARDS

- A. All latest published standards of the following associations/organizations shall be followed and applied where applicable, as minimum requirements:
 1. (ADA), Americans with Disabilities Act.
 2. (ANSI), American National Standards Institute.
 3. (ASTM), American Society for Testing and Materials.
 4. (BOCA), Building Officials and Code Administrators International, Inc.
 5. (CBM), Certified Ballast Manufacturer.
 6. (ETL), Electrical Testing Laboratory.
 7. (EPACT), National Energy Policy Act of 1992.
 8. (ICEA), Insulated Cable Engineers Association.
 9. (IEEE), Institute of Electrical and Electronic Engineers.
 10. (IESNA), Illuminating Engineering Society of North America.
 11. (NBFU), National Board of Fire Underwriters.
 12. (NEMA), National Electrical Manufacturers Association.
 13. (NEC), National Electric Safety Code.
 14. (NFPA), National Fire Protection Association.
 15. (UL), Underwriter's Laboratories.

1.8 PERMITS

- A. General: Obtain and pay for all permits required by all applicable agencies prior to commencing work.

1.9 QUALITY ASSURANCE

- A. Manufacturers' Qualifications: Not less than three (3) years of experience in the actual production of the specified products.
- B. Installers' Qualifications: Firm with not less than five (5) years of experience in the installation of electrical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.
- C. Incidental Work: Painting, patching, welding, carpentry, and the like related to or required for Division 26 work shall be performed by craftsman skilled in the appropriate trade but shall be provided for under Division 26.

1.10 SUBMITTALS

- A. General: Prepare and submit for approval, per the procedures set forth in Division 1, all submittals required by Division 1, this section, and by all other Contract Documents.
- B. Types: Required submittals may include: Schedule of Values; List of Subcontractors; Product Data; Shop Drawings; Samples; Test Reports; Certifications; Warranties; Maintenance Manuals; Record Drawings; and various administrative submittals.

- C. Number of Copies: As indicated in Division 1, Division 26, or elsewhere in the Contract Documents. For quantities indicated in the Contract Documents or specification sections other than Division 26 sections, increase number of copies by one to allow for the Engineer's record copy.
- D. Product Data: Submit for equipment, devices, and materials as required in subsequent individual Division 26 sections. Product data to consist of manufacturer's standard catalog cuts, descriptive literature, and/or diagrams in 8-1/2-inch-by-11-inch format and in sufficient detail to clearly indicate compliance with all specified requirements and standards. Mark each copy to clearly indicate proposed product, options, finishes, etc.
- E. Shop Drawings: Submit for equipment and systems as required in subsequent individual Division 26 sections. Shop Drawing to be newly prepared, specifically for this project, and shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, dimensions, nameplate data, sizes, capacities, types, materials, performance data, features, accessories, wiring diagrams, etc., in sufficient detail to clearly indicate compliance with all specified requirements and standards.
- F. Maintenance Manuals: Include operating and maintenance data in accordance with Division 1 for each Division 26 section requiring a Product Data and/or Shop Drawing submittal. Include the respective Product Data/Shop Drawing submittals as well as descriptions of function, normal operating characteristics and limitations, and manufacturer's printed operating, maintenance, trouble shooting, repair, adjustment, and emergency instructions, and complete replacement parts listing.
- G. Record Documents: Prepare and submit in accordance with Division 1. In addition to Division 1 requirements, indicate actual installed locations for all equipment and devices, routing of major interior raceways, locations of all concealed and underground equipment and raceways, and all approved modifications to the Contract Documents, and deviations necessitated by field conditions and change orders.

1.11 INSPECTIONS

- A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all electrical work installed under this contract, in accordance with the Conditions of the Contract.
- B. Inspections Required: As per the laws and regulations of the local and state agencies having jurisdiction at the project site.
- C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.
- D. Certificates: Submit all required inspection certificates.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Where Specified: Materials and equipment shall be as specified in subsequent sections of the Project Manual and/or as indicated on the Drawings.

General Requirements: All materials and equipment shall be in accordance with the Contract Documents, and to the extent possible, standard products of the various manufacturers, except where special construction or performance features are called for. All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

- C. Acceptable Products: The product of a specified or approved manufacturer will be acceptable only when that product complies with or is modified as necessary to comply with all requirements of the Contract Documents.
- D. Common items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.
- E. UL Listing: All electrical materials and equipment shall be Underwriters' Laboratories (UL) listed and labeled, where UL standards and listings exist for such materials or equipment.

2.2 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to the Conditions of the Contract, and Division 1.

PART 3 – EXECUTION

3.1 GENERAL

- A. The installation of all electrical work shall be in accordance with the letter and intent of the Contract Documents, as determined by the Engineer.
- B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.
- C. Administration and Supervision: All electrical work shall be performed under the Contractor's direct supervision, using sufficient and qualified personnel as necessary to complete the work in accordance with the progress schedule. The Contractor shall assign one or more competent supervisors who shall have authority to accept and execute orders and instructions, and who shall cooperate with the other Contractors and subcontractors, the Engineer and Owner in all matters to resolve conflicts and avoid delays.

3.2 DELIVERY STORAGE AND HANDLING

- A. Comply with Division 1 requirements.
- B. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer's identification, and compliance labels.

- C. Storage and Protection: Comply with all manufacturer's written recommendations. Store all products in a manner which shall protect them from damage, weather, and entry of debris.
- D. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

3.3 EXAMINATION

- A. Conditions Verification: Examine the areas and conditions under which the work is to be performed and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.4 COORDINATION

- A. General: Sequence, coordinate, and integrate the installation of all electrical materials and equipment for efficient flow of work, in conjunction with the other trades. Review the Drawings for work of the other trades, and report and resolve any discovered discrepancies, prior to commencing work.
- B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.
- C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the electrical work.
- D. Supports and Sleeves: Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- E. Obstacles and Interferences: When installing equipment and raceways, provide offsets, fittings, accessories, and changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.

3.5 DIMENSIONS

- A. Building Dimensions: For exact locations of building elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.
- B. Limiting Dimensions: Equipment outlines shown on detail drawings of 1/4" = 1'-0" scale or larger and dimensions indicated on the Drawings are limiting dimensions. Do not install equipment exceeding dimensions indicated by outlines on Drawings, or equipment or arrangements that reduce indicated clearances.

3.6 EQUIPMENT PROTECTION

- A. Protect all electrical equipment, and materials and work from the weather elements, paint, mortar, construction debris and damage, until project is substantially complete. Repair, replace, clean all electrical work so affected.

3.7 CHECKOUT, TESTING, AND ADJUSTING

- A. General: Schedule and provide testing equipment, materials, instruments, and personnel as necessary to checkout and to perform all test procedures and adjustments required by the Contract Documents and/or deemed necessary by the Engineer to establish proper performance and installation of electrical systems and equipment. All test instruments to be accurately calibrated and in good working order.
- B. Scheduling: Schedule tests at least three days in advance, and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational, unless indicated or directed otherwise.
- C. Manufacturer's Authorized Representatives: When required by subsequent Division 16 specification sections, arrange and pay for the services of the manufacturer's authorized representative(s) to be present at time of equipment or system start-up, to supervise the start-up, and to conduct and/or certify all required testing and adjusting.
- D. Test Reports: Submit test reports neatly typewritten on 8-1/2-inch-by-11-inch sheets indicating system or equipment being tested, methodology of testing, date, and time of test, witnesses of test, and test results. Submit test reports in three (3) copies to the Engineer for review within five (5) days after test is performed and include a copy with the appropriate operation and maintenance data.
- E. Correction/Replacement: After testing, correct any deficiencies, and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken, and satisfactory results of retest.

3.8 SYSTEMS DEMONSTRATION

- A. Instruct the Owner's representative(s) in the start-up, operation, and maintenance of all electrical systems and equipment in accordance with Division 1 as required by subsequent sections and as requested by the Owner's Representative.

3.9 CLEANING AND TOUCH-UP PAINTING

- A. Perform cleaning required by Division 1.
- B. General: Periodically remove from the project site, all waste, rubbish and construction debris accumulated from construction operations, and maintain order. The premises shall be left clean and free of any debris and unused construction materials, prior to final acceptance.
- C. Electrical Equipment: Remove all dust, dirt, debris, mortar, wire scraps, rust, and other foreign materials from the interior and exterior of all electrical equipment and enclosures and wipe down. Clean accessible current carrying elements and insulators prior to energizing.
- D. Light Fixtures: Thoroughly clean all light fixtures and lamps, just prior to final inspection.

Fixture enclosures, reflectors, lenses, etc. shall be cleaned free of dust, dirt, fingerprints, etc. by an approved method.

- E. Touch-Up Painting: Restore and refinish to original condition, all surfaces of electrical equipment scratched, marred and/or dented during shipping, handling, or installation. Remove all rust, and prime and paint as recommended by the manufacturer.

- END OF SECTION -

SECTION 260501**BASIC ELECTRICAL MATERIALS & METHODS****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes: General requirements, and basic electrical materials and methods applicable to all Division 26 work. Limited scope general construction materials and methods for application with electrical installations are also included.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's descriptive literature for each type of fire-stopping material to be used on the project.

1.3 COORDINATION

- A. Chases, slots, inserts, sleeves, and openings: Coordinate with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

PART 2 – PRODUCTS**2.1 PIPE SLEEVES**

- A. Rigid steel conduit or iron pipe.

2.2 SOIL MATERIALS

- A. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.
- B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2-inch sieve and not more than 5 percent passing a No. 4 sieve.
- C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP, free of clay, rock, or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter.

2.3 CONCRETE WORK

- A. Concrete:
 - 1. Strength: 3000 psi (20.7 – MPa at 28 days (compressive strength), Pads 2500 psi (17.3 - MPa) at 28 days (trench).

2. Aggregate: 3/4-inch aggregate.
 3. Cement: 588 #/cubic yard minimum, Type I or II.
 4. Slump: 4 inches maximum.
 5. Air: 5 to 7 percent.
- B. Reinforcing: Grade 60 bars, sized as indicated, and 6-inch by 6-inch - W1.4 x W1.4 mesh and other reinforcing as indicated.
 - C. Forms: Wood, metal or other approved materials, constructed so as to withstand the forces of the newly placed concrete.
 - D. Equipment Pads: Minimum 3-1/2-inch thick indoor, 12-inch thick outdoor (with 9 inches below grade) with 1 inch by 45-degree chamfer on all top edges. For on grade installations, provide 12- inch layer of crushed stone beneath pad. For pads to be placed on concrete floors, provide anchors into concrete floor. Coordinate equipment pad with site

2.4 TOUCH UP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 – EXECUTION

3.1 ELECTRICAL INSTALLATION - GENERAL

- A. Unfinished and Finished Areas: For the purposes of these electrical specifications, "unfinished" areas shall include mechanical, electrical, and telephone equipment rooms. All other areas shall be considered "finished" spaces unless indicated or approved otherwise.
- B. In Unfinished Areas: Raceways, equipment, and devices may be installed, concealed or exposed, unless indicated otherwise.
- C. Headroom: Arrange and install components and equipment to provide the maximum possible headroom, unless otherwise indicated.
- D. Dimensions and Clearances: Field measure all dimensions and clearances affecting the installation of electrical work, in relation to established datum, building openings and clearances, and work of other trades, as construction progresses.
- E. Rough-In Locations: Verify final locations for rough-ins with field measurements and requirements of actual equipment being installed.
- F. Door Swings: Verify the swings of all doors before switch outlets or other electrical devices are installed. If necessary, relocate devices so they are not obstructed by doors when doors are open.

3.2 LAYOUT

- A. General: Install electrical systems, materials and equipment level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

- B. Serviceability: Install electrical equipment and raceways, etc. to readily facilitate servicing, maintenance and repair or replacement of components, and so as to minimize interference with other equipment and installations.
- C. Clearances: Prior to commencing work, verify that all electrical equipment will adequately fit and conform to the indicated and code required clearances, in the spaces indicated on the Drawings. If rearrangement is required, submit plan and elevation drawings or sketches indicating proposed rearrangement, for the Engineer's approval. Do not rearrange without express written permission of the Engineer.
- D. Right-Of-Way: When laying out electrical work, give priority in available space to steam and condensate lines, sanitary lines, drain lines, fire protection piping and sheet metal duct work. Provide offsets as required to avoid conflicts. Resolve all conflicts before commencing installation.

3.3 MOUNTING HEIGHTS

- A. General: Indicated heights are measured from the center of the device outlet box to finished floor or grade, unless indicated otherwise. Mounting height for light switches shall be 4'-0" above finished floor/ grade unless the switch is integral to the device and outlets shall be mounted 1'-6" above finished floor/ grade.
- B. Adjustments: Adjust mounting heights in exposed masonry construction so that bottoms of outlet boxes are along the edges of blocks, unless indicated otherwise.

3.4 HOLES, SLEEVES, AND OPENINGS

- A. General: Provide all holes, sleeves, and openings required for the completion of Division 26 work and restore all surfaces damaged, to match surrounding surfaces. Maintain integrity of all fire and smoke rated barriers using approved firestopping systems. When cutting holes or openings, or installing sleeves, do not cut, damage or disturb structural elements or reinforcing steel, unless approved, in writing, by the Project Structural Engineer.
- B. Conduit Penetrations: Size core drilled holes so that an annular space of not less than 1/4 inch and not more than 1 inch is left around the conduit. When openings are cut in lieu of core drilled, provide sleeve in rough opening. Size sleeves to provide an annular space of not less than 1/4 inch and not more than 1 inch around the conduit. Patch around sleeve to match surrounding surfaces.

3.5 FIRESTOPPING SYSTEMS

- A. General: Install firestopping at all electrical raceway and cable penetrations through floor structures and interior walls or partitions which are time-rated fire and/or smoke barriers.
- B. Preparation: Prior to installation, verify that all penetrating elements and supporting devices are permanently installed and that surfaces which will be in contact with penetration seal materials are clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.
- C. Installation: Install firestop systems in accordance with UL approved design details and the manufacturer's instructions. Install sleeves, conduits, and cables with required clearance spaces, allowing installation of sealing materials. Do not exceed the outside diameter of the sleeve, conduit or cable by more than one inch or by less than 1/4 inch when making openings for penetrations. Install firestop systems so as to completely seal openings to prevent passage of smoke and water.

3.6 CUTTING AND PATCHING

- A. General: Provide all cutting, drilling, chasing, fitting and patching necessary for accomplishing the work of Division 26. This includes any and all work necessary to: uncover work to provide for the installation of ill-timed work; remove and replace defective work and work not conforming to the requirements of the Contract Documents; install equipment and materials in existing structures; in addition to that required during the normal course of construction.
- B. Comply with the cutting and patching requirements of Division 1.
- C. Building Structure: Do not endanger the integrity of the building structure by cutting, drilling or otherwise modifying any structural member, without specific approval. Do not proceed with any structural modifications without written permission of the Project Structural Engineer.
- D. Repairs: Repair any and all damage to work of other trades caused by cutting and patching operations, using skilled mechanics of the trades involved.

3.7 WELDING

- A. General: Where welding is required, such welding shall be performed in a skilled manner by certified welders. Verify that welds are free from cracks, craters, undercuts, and strikes, weld spatter, and any other surface defects. Clean and re-weld any welds deemed unacceptable in size or configuration. Do not weld to structural steel without prior written permission from the Project Structural Engineer.

3.8 UNDERGROUND ELECTRICAL WORK

- A. General: Perform all excavating, trenching and backfilling, etc. as indicated or required for the installation of all underground electrical work. Coordinate work with other trades and verify existing underground services and conditions.
- B. Conduit Burial Depth: 30" below finished grade, unless indicated otherwise. All excavation and burial depths indicated are below finished grade.
- C. Excavating: Do not excavate below required depth, except as necessary for removal of unstable soil or when rock is encountered. When rock is encountered, excavate six inches below the required depth and backfill with a minimum 6-inch layer of crushed stone or gravel between rock bearing surface and the electrical installation. Stockpile satisfactory excavated materials where directed, until required for backfilling. Remove and legally dispose of excess excavated materials and materials not suitable for backfill use. Shore and brace as required for stability of excavation. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting off at an elevation of 30" below finished grade.
- D. Protection: Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by excavations.
- E. Existing Utilities: Remove existing electrical and other utility lines so indicated. Where existing utilities which are to remain exist within areas of excavation, locate such utilities and support and protect during excavation operations.

- F. Trenching: Cut all trenches neatly and uniformly and so as to provide ample working room and at least six inches clearance on both sides of raceways, etc. Take necessary precautions when working near existing underground utilities, and coordinate with the installation of concurrent utilities by other trades. Unless indicated otherwise, pitch all electrical conduit runs downward away from buildings, manholes, and pad mounted equipment. Excavate trenches to depth indicated or required. Limit length of open trench to that in which installations can be made and trenches backfilled within the same day.
- G. Sand Envelope: Install a minimum envelope of three inches (top, bottom, and sides: three inches each) of fine grain sand around all electrical cables and conduits installed below grade unless indicated otherwise.
- H. Preparation for Backfilling: Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approvals, and recording of underground utility locations. Prior to backfilling, remove all concrete form work, shoring, bracing, trash and debris.
- I. Backfilling: Use only approved materials free from boulders, sharp objects and other unsuitable materials. Match the final elevations and materials of areas affected by electrical excavating, trenching and backfilling. Replace conduit and cables damaged by improper backfilling. Replace surface materials to match existing surface materials if no other utility or site work is being done in area. Place specified soil materials in 4- to 8-inch layers to required subgrade elevations, for area classifications as follows:
1. Under Sidewalks and Pavements: Use combination of subbase materials and excavated or borrowed materials.
 2. Under Building Slabs: Use drainage fill materials.
 3. Under Piping and Equipment: Use subbase materials where required over rock bearing surfaces and for correction of unauthorized excavation.
 4. For Raceways less than 30 Inches below Surface of Roadways: Provide 4-inch thick concrete base slab support. After raceway installation, provide 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
- J. Backfill Placement: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- K. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.
- L. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D1557 and not less than the following percentages of relative density, determined in accordance with ASTM D2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
1. Areas under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive materials and 95 percent relative density for cohesionless

materials.

2. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive materials, and 95 percent relative density for cohesionless materials.
 3. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive materials, and 90 percent relative density for cohesionless materials.
- M. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
- N. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.9 CONCRETE WORK

- A. General: All concrete shall be prepared from approved materials and poured on clean, stable surfaces.
- B. Exterior Base Surfaces: Six-inch layer of crushed stone over well consolidated, stable, undisturbed soil. Where the underlying soil contains excess organic material, trash or voids, or fails to provide solid bearing for any other reason, excavate to the depth required for solid bearing and re-establish the required elevation with approved granular materials.
- C. Finishing: Trowel all exposed surfaces smooth. Round-off or chamfer all exposed edges.
- D. Curing: Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures and mechanical injury. Maintain minimal moisture loss at relatively constant temperature throughout period necessary for hydration of cement and hardening of concrete.

3.10 REFINISHING AND TOUCH UP PAINTING

- A. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- B. Repair damage to paint finishes with matching touch-up coating recommended by manufacturer.

3.11 CLEANING AND PROTECTION

- A. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

- END OF SECTION -

SECTION 260519
BUILDING WIRE & CABLE

PART 1 – GENERAL

1.1 SUMMARY

- A. Description of Work: Provide wire, cable, and connectors as indicated or required for all feeders, branch circuits, control circuits, etc.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's descriptive literature for each wire and connector type to be used on the project.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All wiring systems to consist of individual conductors installed in conduit or other raceway, unless specifically indicated otherwise.

2.2 600 VOLT CLASS WIRE

- A. General: All wire and cable shall be constructed in accordance with all applicable ICEA, NEMA and IEEE published standards, and shall be UL-listed and labeled.
- B. Single-conductor, 98% conductivity, annealed uncoated copper conductor, with 600-volt rated insulation.
- C. No. 10 AWG and Smaller: Solid or stranded, 90 DegC with Type THNN/THWN insulation.
- D. No. 8 AWG and Larger: Class B stranded, 90 DegC with Type THNN/THWN insulation.
- E. Do not use aluminum or copper-clad aluminum alloy conductors.
- F. Acceptable Manufacturers:
 - 1. General Cable, Cerro Wire.
 - 2. Southwire, Encore Wire.

2.3 CONNECTORS

- A. General: UL-listed, factory fabricated designed for the application.
- B. Splicing Connectors (No. 14-10 AWG): Nylon shell insulated metallic screw-on connectors.

- C. Cable Connectors (No. 8 AWG and Larger): Cable connectors for making terminations, tee-taps and splices shall be bolted pressure or compression type lugs and connectors, with molded plastic insulators.
- D. Terminations (No. 10 AWG and smaller, stranded): Nylon insulated, crimp ring or fork type terminals for connection to screw terminals.
- E. Acceptable Manufacturers:
 - 1. Amp.
 - 2. Burndy, IlSCO.
 - 3. Ideal.
 - 4. 3M.
 - 5. Thomas & Betts.

2.4 TAPES

- A. Acceptable manufacturers:
 - 1. Plymouth.
 - 2. 3M Scotch Brand.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine all wire and cable prior to installation. Do not use wire and cable with bruised, cut, or abraded insulation; or wire that does not pass a continuity test.

3.2 CONDUCTOR SIZES AND QUANTITIES

- A. Minimum Conductor Size: All branch circuit wiring shall be minimum No. 12 AWG. All control circuit wiring shall be minimum No. 14 AWG. Provide larger sizes as indicated or required.
- B. Branch Circuit Conductor Sizes: Provide branch circuit conductor sizes as indicated on the panelboard schedules, plans, or elsewhere. Neutral conductor size to match phase conductors unless approved by Engineer.
- C. Equipment Grounding Conductor Required: For each branch circuit and feeder run, provide an equipment grounding conductor for continuous length of run, sized per NEC 250.122 (minimum), larger if so indicated.
- D. Separate Neutral: For branch circuit homeruns with two or three single-pole circuits (of different phases) use separate neutral conductors, unless approved by Engineer.
- E. Switch Legs: Provide branch circuit switch legs and travelers as required for the switching indicated.
- F. Feeders: Provide feeder conductor sizes and quantities as indicated.

3.3 INSTALLATION

- A. General: Install all conductors and other associated items in compliance with applicable requirements of NEC, NEMA, UL and NECA's "Standards of Installation" and in accordance with manufacturer's recommendations.
- B. In Raceway: Install all wiring in conduit or other specified raceway unless indicated otherwise.
- C. Terminations: Furnish and install terminations, including lugs if necessary, to make all electrical connections indicated or required. Make connections and terminations for all stranded AWG conductors using crimp, clamp, or box type connectors and terminators. Enclose all strands of stranded conductors in connectors, and lugs.
- D. Tightening: Tighten all connectors, lugs, screws, bolts, Allen-heads and other electrical fasteners to torque values per manufacturer's written instructions.
- E. Restrictions: Do not substitute smaller conductors with higher temperature rated insulations in lieu of conductor size shown on Drawings.

3.4 COLOR CODE

- A. Color code all branch circuit and feeder conductors as follows:
- B. 208/120 Volts:

PHASE	COLOR
A	Black
B	Red
C	Blue
Neutral	White

- C. 480/277 Volts:

PHASE	COLOR
A	Brown
B	Orange
C	Yellow
Neutral	Gray

- D. Equipment Grounding Conductors: Green
- E. Conductors No. 10 AWG and Smaller: Color impregnated.
- F. Conductors No. 8 and larger may use color impregnated insulation, or conductor ends may be taped. Taping to be with solid color electrical tape, lap wound, visible without removing dead-front covers in electrical equipment with at least 3 inches visible at all terminations and electrical boxes.

3.5 PHASE ARRANGEMENT**3.6 HIGH TEMPERATURE WIRE**

- A. Arrange phases in all electrical equipment as follows:
 - 1. A, B, C: Front to Rear.
 - 2. A, B, C: Top to Bottom.
 - 3. A, B, C: Left to Right When Facing Established Front of Equipment.

3.7 HIGH TEMPERATURE WIRE

- A. Provide conductors with not less than 90 DegC rated insulation when branch circuit wiring is attached to high temperature light fixtures (e.g., fluorescent & HID), boilers, incinerators, ovens, ranges, kitchen exhaust fans, other heat-producing equipment, and "100 Percent Rated" overcurrent protective devices. Use special higher temperature wire as required for connection to specialty equipment as required by equipment manufacturer.

- END OF SECTION -

SECTION 260523
MOTOR POWER & CONTROL WIRING

PART 1 – GENERAL

1.1 SUMMARY

- A. Description of Work: Provide all power and control wiring for and make connections to motors and motor control equipment.
- B. Motors: In general, motors are provided under Division 33.
- C. Motor Control Equipment: In general, motor control equipment is provided, installed, and wired under this Division. Exceptions are as indicated on the drawings and specified herein.
- D. Coordinate with Divisions 33 so that:
 - 1. There is no duplication of services or materials provided.
 - 2. Motor controllers provided are specifically designed for and fully compatible with each motor supplied by Divisions 33 in every aspect.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.
- B. All Division 26 Specifications shall apply to this Section.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1.

1.4 QUALITY ASSURANCE

- A. Minimum Components and Installation Requirements: NFPA70 "National Electrical Code" (NEC).

PART 2 – PRODUCTS

2.1 GENERAL

- A. Equipment and materials as specified elsewhere in Division 26 or as indicated on the Drawings.

PART 3 – EXECUTION

3.1 GENERAL

- A. Connections: Make all connections to motors and control equipment complete and leave equipment in proper operating order. Connect power to motors for correct rotation. Verify

nameplate ratings of all motors. Report any deviations or discrepancies.

- B. Coordination: Coordinate with Divisions 33 as required.

3.2 POWER WIRING

- A. General: Unless indicated otherwise, provide all required power wiring from indicated power source to each disconnect, controller, and motor, as required.

- 1. If wire size is not indicated, minimum size will be as indicated in NEC Article 430.

3.3 CONTROL WIRING

- A. Coordination: Provide all control wiring as indicated on the Division 26 motor control notes, diagrams or elsewhere. Coordinate all control interfaces with Division 33.
- B. Wire Size: Unless indicated otherwise use No. 14 AWG wire for all control circuits. For circuits longer than 200 feet use No. 12 AWG wire.
- C. Control Circuit Power: Connect all control circuitry for motors so that when the circuit to the motor is disconnected, the control power is also disconnected. When control power is from a source other than the motor's power source, install an auxiliary control power interlock switch integral with the motor's or motor controllers disconnect. If the equipment design does not allow this, install a lockable, labeled control power disconnect immediately adjacent to the motor disconnect.
- D. Installation: Install all control wiring in conduit. Neatly group, tie and strap in place all control wiring, and terminate at labeled terminal strips. Label control wires at each termination with heat shrink tube type label. Label shall indicate field device connected to it or as indicated on the drawings.
- E. Control Circuit Integration: Where a PLC controller is utilized and interfaced with relays and other inductive switching equipment for the control and protection of motors the contractor shall utilize protective circuitry, "flyback diode", to extend the service life of the PLC. Follow PLC manufacturer's recommendation for protection.

- END OF SECTION -

SECTION 260526**GROUNDING & BONDING FOR ELECTRICAL SYSTEMS****PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section "Operation and Maintenance Data," include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells based on NFPA 70B.
 - b. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - c. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. ERICO International Corporation.
 - 3. Fushi Copperweld Inc.
 - 4. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - 5. Harger Lightning and Grounding.
 - 6. ILSCO.
 - 7. O-Z/Gedney; A Brand of the EGS Electrical Group.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B3.
 - 2. Stranded Conductors: ASTM B8.
 - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 4. Bonding Conductor: No. 4, stranded conductor.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel 3/4 inch by 10 feet.

PART 3 – EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 44 AWG minimum.
 - 1. Bury at least 24 inches below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection with alternating bands of green and yellow tape and with at least three (3) bands of green and two (2) bands of yellow.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
- C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. 1'-0" diameter by 2'-0" long concrete pipe with 3000 PSI concrete cap. Rod driven to 6" below ground level or concrete and back fill with clean dry sand leaving top of ground rod and connection exposed for inspection.

Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding for Steel Enclosure Structure: Install ground conductor to electrical enclosures.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at ground test wells.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
1. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.

- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

- END OF SECTION -

SECTION 260533**RACEWAYS & BOXES FOR ELECTRICAL SYSTEMS****PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Boxes, enclosures, and cabinets.
 - 5. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

- A. GRC/ RGS: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

PART 2 – PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements provide products by the following:
1. AFC Cable Systems, Inc.
 2. Allied Tube & Conduit
 3. Anamet Electrical, Inc.
 4. Electri-Flex Company
 5. O-Z/Gedney
 6. Picoma Industries
 7. Republic Conduit
 8. Robroy Industries
 9. Southwire Company
 10. Thomas & Betts Corporation
 11. Western Tube and Conduit Corporation
 12. Wheatland Tube Company
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch minimum
- F. EMT: Comply with ANSI C80.3 and UL 797
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70
 2. Fittings for EMT:
 - a. Material: Steel
 - b. Type: Setscrew or compression
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING & FITTINGS

- A. Manufacturers: Subject to compliance with requirements provide products by the

following:

1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.
 3. Arnco Corporation
 4. CANTEX Inc.
 5. CertainTeed Corporation
 6. Condux International, Inc.
 7. Electri-Flex Company
 8. Kraloy
 9. Lamson & Sessions; Carlon Electrical Products
 10. Niedax-Kleinhuis USA, Inc.
 11. RACO; Hubbell
 12. Thomas & Betts Corporation
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653
- D. RNC: Type EPC-40-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated
- E. LFNC: Comply with UL 1660
- F. Rigid HDPE: Comply with UL 651A
- G. Continuous HDPE: Comply with UL 651B
- H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485
- I. RTRC: Comply with UL 1684A and NEMA TC 14
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material
- K. Fittings for LFNC: Comply with UL 514B
- L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
- M. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements 1 provide products by the following:
1. Adalet
 2. Cooper Technologies Company; Cooper Crouse-Hinds
 3. EGS/Appleton Electric
 4. Erickson Electrical Equipment Company

5. FSR Inc
 6. Hoffman
 7. Hubbell Incorporated
 8. Kraloy
 9. Milbank Manufacturing Co
 10. O-Z/Gedney
 11. RACO; Hubbell
 12. Robroy Industries
 13. Spring City Electrical Manufacturing Company
 14. Stahlin Non-Metallic Enclosures
 15. Thomas & Betts Corporation
 16. Wiremold / Legrand
 17. Eaton.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD with gasketed cover
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 pounds. Outlet boxes designed for attachment of luminaires weighing more than 50 pounds shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773 galvanized with gasketed cover.
- H. Device Box Dimensions: 4 inches square by 2-1/8 inches deep or 4 inches by 2-1/8 inches by 2-1/8 inches deep
- I. Gangable boxes are prohibited.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 4X with continuous- hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: stainless steel
 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel
- K. Cabinets:
1. NEMA 250, Type 1, Type 3R, Type 4x galvanized-steel/ stainless-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge
 3. Key latch to match panelboards
 4. Accessory feet where required for freestanding equipment
 5. Provide pad lockable doors and/ or covers for exterior cabinets or where cabinet will not be secure from public access.

2.3 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70 for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.

PART 3 – EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: GRC and EMT.
 3. Underground Conduit: Type ePC 80 PVC.
 4. Boxes and Enclosures, Aboveground: NEMA Type 3R and Type 4X.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: GRC.
 2. Exposed, Not Subject to Severe Physical Damage: GRC.
 3. Exposed and Subject to Severe Physical Damage: GRC.
 4. Damp or Wet Locations: GRC.
 5. Boxes and Enclosures: NEMA Type 1, except use NEMA Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

- G. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. Terminate exterior conduits with threaded watertight conduit hubs on boxes or cabinets.
- N. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous groundpath.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-pound tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bendpoints.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 DegF and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 DegF temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 DegF temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 DegF temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per DegF of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- X. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
 - 2. Install backfill as specified in Section "Earth Moving."
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward

end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section "Earth Moving."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Tape shall be detectable (by metal detector, etc.) and shall comply with requirements in Section "Identification for Electrical Systems."

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.5 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section "Penetration Firestopping."

3.6 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

- END OF SECTION -

SECTION 260553
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide electrical equipment nameplates, junction, pull and outlet box labels, raceway identification, wiremarkers, receptacle circuit identification, and warning signs for electrical equipment and field wiring included in this Contract, as specified herein.
- B. This Section includes products and installation requirements for identification of electrical equipment, raceways, and conductors, wiring devices, warning signs.

1.2 CODES AND STANDARDS

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code - NEC
 - 2. NFPA 70E Standard for Electrical Safety in the Workplace
 - 3. Underwriter's Laboratories, Inc. UL

1.3 QUALITY ASSURANCE

- A. Manufacturers: Manufacturers shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer, and shall offer NRTL-listed and labeled products.
- B. Comply with NFPA 70.

1.4 SUBMITTALS

- A. Make submittals in accordance with the General Provisions.
- B. Submittals shall include the following:
 - 1. Complete list of all engraved nameplates.
 - 2. Sample of each size of engraved nameplate, punched tape labels, wiremarkers, and laminated instrument tags.

PART 2 - PRODUCTS

2.1 EQUIPMENT NAMEPLATES

- A. Provide custom nameplates for all equipment listed in Part 3 of this Section.
- B. Nameplates shall have white letters engraved on black field, and shall be fabricated from

3-layer (black-white-black) thermoset plastic.

- C. Drill holes in nameplates to be fastened with tie-wraps as described in Part 3 of this Section.
- D. Nameplate lettering to be uppercase Roman block letters, minimum height as follows:
 - 1. Switchboards, Generators, MCCs, VFCs, panelboards, and transformers: 3/4 inch.
 - 2. Process Control Panels (unless factory-labeled): 1/2 inch.
 - 3. Valve actuators: 3/8 inch.
 - 4. Other equipment: 1/4-inch minimum.

2.2 PUNCHED TAPE LABELS (RECEPTACLE IDENTIFICATION)

- A. Punched Tape Labels for identification of receptacle circuits shall be 1/2 -inch clear tape with black lettering.
- B. Manufacturer: Dymo or approved equal

2.3 WIREMARKERS

- A. Wiremarkers shall be computer-printed on white wrap-around paper with clear plastic protective "tail" and pressure-sensitive adhesive.
- B. Manufacturer: Brady, T&B, Panduit, or approved equal.

2.4 WIRE COLOR CODING

- A. Comply with NEC requirements for applying color-coding.
- B. Color Coding for service, feeder, and branch circuit wiring shall be as follows:

1.	208 / 120 VOLTS	A-B-C-N-G	Black	Red	Blue	White	Green
2.	240 / 120 VOLTS	A-B-C-N-G	Black	Red	Blue	White	Green
3.	480 / 277 VOLTS	A-B-C-N-G	Brown	Orange	Yellow	Gray	Green
- C. Color coding for 120 VAC control wiring shall be as follows:
 - 1. Line - Black
 - 2. Neutral - White
 - 3. Ground - Green
 - 4. Switched - any color except black, white, and green.
- D. Color coding for 4-20 mA DC signal wiring shall be the manufacturer's standard insulation color.
- E. Color coding for DC power and control circuits:
 - 1. Negative polarity - Black

2. Positive polarity - Red
3. Switched - any color except black, red, white, and green.

2.5 WARNING SIGNS

- A. Provide warning signs on electrical equipment, electrical room doors, and automatically started mechanical equipment in accordance with NEC, NFPA 70E, and OSHA requirements.
- B. Apply arc flash hazard warning labels to electrical power distribution equipment using the data from Division 16 Section "Coordination Study".

PART 3 - INSTALLATION

3.1 NAMEPLATES

- A. Fabricate equipment nameplates using the description and tag number nomenclature shown on the Drawings.
- B. Provide equipment nameplates for transfer switches, panelboards, enclosed motor controllers and contactors, enclosed circuit breakers, transformers, disconnect switches, motor control centers, valve actuators, and major fire alarm system components.
- C. Fasten nameplates to flat sheet metal with pressure-sensitive two-sided adhesive tape.
- D. Fasten nameplates to valve actuators with nylon tie-wraps.

3.2 WIRE COLOR CODING AND MARKING

- A. Color code phase, neutral, and ground wires for service conductors, feeders, and branch circuits, at points of origin and termination of wires.
- B. Provide wiremarkers on all control and signal wires, as shown on the approved Loop Diagrams, Motor Control Wiring diagrams, and Control Panel field wiring diagrams.

3.3 CONDUIT IDENTIFICATION

- A. Clean conduit surfaces with mineral spirits. Write conduit number shown on the Conduit & Wire Schedules on each conduit at each exposed conduit termination point.

3.4 SPECIAL PANELBOARD REQUIREMENTS

- A. Nameplates
 1. Identify in accordance with the Panelboard Schedule shown on the Drawings.
- B. Directory
 1. Provide complete typewritten directory for each panel, with all load information and room name and/or numbers, functions, etc., positively identified for each individual branch circuit.

2. Handwritten directory shall be provided until all circuits are connected and balanced. Then, install permanent directory.
3. Lighting branch circuits shall be identified in the panel directory as to location.
4. Electrical subfeed circuits from panels shall also be identified in the panel directories.
5. When branch circuits are relocated, the panel directory shall be updated to indicate functions, and locations.
6. When branch circuits are removed the panel directory shall be updated to indicate a spare.

-- END OF SECTION --

SECTION 260620**PANELBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide panelboards as shown on the Drawings and specified herein.

1.2 RELATED DOCUMENTS

- A. Drawings and the General and Special Provisions of the Contract apply to this Section.
- B. Transient voltage surge suppressors for panelboards are specified in Division 16 Section "Transient Voltage Surge Suppression".

1.3 GENERAL

- A. This Section describes requirements for the following:
 - 1. Distribution panelboards.
 - 2. Lighting and appliances branch-circuit panelboards.

1.4 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.5 SUBMITTALS

- A. Conform to the General and Special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.
- C. Product Data: For each type of panelboard, overcurrent protective device, transient voltage surges suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

- D. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensions plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power and control wiring.
- E. Panelboard Schedules: For installation in panelboards.
- F. Operation and Maintenance Manuals: Conform to the Special Provisions. Include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.7 PROJECT CONDITIONS

- A. Conform to the requirements in Division 16 section "Electrical - General".

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Keys: Two spares for each type of panelboard cabinet lock.
 - 2. Key all panelboards alike.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Corporation; Cutler-Hammer Products.
 - 2. General Electric Co.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D.

2.2 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets, as shown on the drawings NEMA PB 1, enclosure type in conformance with Division 16 section " Electrical - General".
 - 1. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, matchbox dimensions; for flush-mounted fronts, overlap box.
 - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Provide full height piano hinge.
 - 3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
 - 4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
 - 5. The manufacturer's nameplate shall be of corrosion resistant metal such as stainless steel and have the pertinent ratings embossed in raised letters and numerals. The pertinent ratings shall include at least the following; amperage, voltage, phase, wires, AIC, manufacturer and model number.
- B. Phase and Ground Buses:
 - 1. Material: Tin-plated hard-drawn copper, 98% conductivity.
 - 2. All busing shall be constructed of the same material.
 - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
 - 4. Split Bus: Vertical buses divided into individual vertical sections.
- C. Conductor Connectors: Suitable for use with conductor material.
 - 1. Main and Neutral Lugs: Mechanical type.
 - 2. Ground Lugs and Bus Configured Terminators: Mechanical type.
 - 3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main disconnecting means.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Device: Main lugs (MLO) or main circuit breaker (MCB), as indicated on the drawings.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Main and Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.7 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 - 1. 150 amp frame and smaller: Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.
 - 2. 225 amp frame and larger: Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response. Provide only where indicated on the drawings.
 - 3. GFCI Circuit Breakers: Single- and two-pole configurations with 5 or 30 -mA trip sensitivity as shown on the Drawings.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.8 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

- B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.
- B. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- C. Install overcurrent protective devices and controllers.
 - 1. Set field-adjustable circuit-breaker trip ranges.
- D. Install filler plates in unused spaces.
- E. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Wire and Cable."

3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Infrared Scanning: After occupancy, but not more than 90 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action. Provide a color photo along side an infrared photo of each panelboard in the report.

3.5 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

-- END OF SECTION --

SECTION 260626**WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide switches, receptacles, and accessories required for a complete wiring device installation, as shown on the Drawings and specified herein.

1.2 REFERENCES

- A. Material and installation shall be in accordance with latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. American National Standard Institute (ANSI)
 - 2. National Electrical Code (NEC)
 - 3. National Electrical Manufacturers Association (NEMA)
 - 4. Underwriters Laboratories, Inc. (UL)

1.3 QUALITY ASSURANCE

- A. Qualifications of Manufacturer
 - 1. All equipment furnished under this Section shall be furnished by manufacturers who meet the quality, workman-ship, and experience requirements as specified in the General Provisions section of this Contract.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with the General and special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.
- C. Manufacturer's Catalog Data
 - 1. Submit manufacturers catalog data describing each item and demonstrating conformance to the Specification.
- D. Other Submittals
 - 1. Samples are not required for specified manufacturers and part numbers. If "equal" products are proposed, samples of both the "equal" and the specified product shall be submitted for comparison purposes.

- E. Equal products will not be considered unless samples are submitted.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide industrial grade heavy-duty wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL, and NEMA standards.
- B. Provide ivory color devices unless otherwise indicated.
- C. Model or series numbers, where indicated, refer only to the specified manufacturer. Identical numbers by other manufacturers are not considered equal.

2.2 RECEPTACLES

- A. Receptacles
 - 1. Duplex convenience and appliance receptacles shall be NEMA 5-20R rated 20 amperes at 120 VAC.
 - 2. Duplex receptacles shall be:
 - a. Hubbell 5362 Series heavy-duty industrial grade.
 - b. Leviton 5362 Series heavy-duty industrial grade
 - c. Arrow Hart 5362 Series heavy-duty industrial grade.
 - d. Daniel Woodhead 5362 Series heavy-duty industrial grade.
 - e. Equal (samples of any proposed equal products shall be submitted as noted above).
 - 3. Simplex receptacles shall be NEMA standard straight-blade type, industrial grade with plastic body and plated contacts, suitable for the voltage and current application shown on the Drawings.
- B. GFI Receptacles
 - 1. Receptacles shown as GFI shall be of the ground fault interrupter type. They shall be UL rated Class A, Group 1.
 - a. Hubbell Series GF5262
 - b. Or approved equal.
 - 2. Single GFI Receptacles providing "downstream" protections are not acceptable. Each GFI receptacle shall be GFI type with test and reset buttons.
 - 3. GFI breakers used with conventional receptacles shall not be acceptable where GFI receptacles are shown.
- C. Other Receptacles
 - 1. Other receptacles shall be industrial grade heavy-duty, of the type shown on the Drawings.
- F. Device Boxes for receptacles shall be of the type appropriate for each location as speci-

fied under Division 16 Section "Raceways, Boxes, and Fittings".

2.3 SWITCHES

A. Switches

1. Light switches shall be rated 20 amperes at 277 VAC, toggle operated, thermo-set plastic enclosed, single pole, three-way or four-way as shown on the Drawings.
 - a. Hubbell 1221 Series heavy-duty industrial grade
 - b. Leviton 1221 Series heavy-duty industrial grade
 - c. Arrow Hart 1221 Series heavy-duty industrial grade
 - d. Equal (samples of any proposed equal products shall be submitted as noted above)
2. Switches shall have silver alloy contacts and provisions for side and back wiring.
3. Device boxes for switches shall be of the type appropriate for each location as specified under Division 16 Section "Raceways, Boxes and Fittings".

2.4 DEVICE PLATES

- A. Flush-mounted device plates located indoors shall be brushed stainless steel type 304.
- B. Surface-mounted device plates shall be galvanized steel for stamped steel boxes, and painted malleable iron for type FS and FD boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wall receptacles shall be mounted at 18 inches to the centerline of the device box above finished floor, unless otherwise noted or required by the National Electric Code or the Americans with Disabilities Act (ADA).
- B. Switches shall be mounted 44 inches to the centerline of device box above finished floor on knob side of doors unless otherwise noted or required by the National Electric Code or the Americans with Disabilities Act (ADA). Coordinate switch locations with cabinets, temperature controls, etc. to avoid conflicts.
- C. Install wiring devices and accessories as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.
- D. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.
- E. Install wiring devices only in electrical boxes, which are clean and free from building materials, dirt, and debris.

- F. Install wiring devices after wiring work is completed.
- G. Install wall plates after painting work is completed.

-- END OF SECTION --

SECTION 261216**DRY TYPE TRANSFORMERS (600V AND LESS)****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide energy-efficient dry type transformers (600V and less) as shown on the Drawings and specified herein.

1.2 RELATED DOCUMENTS

- A. Drawings and General and Special Provisions of the Contract apply to this Section.
- B. Related requirements are specified in the following Sections:
 - 1. Division 16 Section "Grounding and Bonding" for transformer grounding.

1.3 GENERAL

- A. This Section describes requirements for dry type distribution and power transformers with primary and secondary windings under 600V.

1.4 DEFINITIONS

- A. In addition to the definitions in Division 16 Section "Electrical General Provisions", the following definitions apply to this Section:
 - 1. AA: air-to-air (dry type, ventilated, self-cooled)
 - 2. AC: alternating current
 - 3. Energy efficient transformer: transformer kVA rating is at lower than maximum temperature rise for a particular insulation class
 - 4. FA: forced-air (cooled)
 - 5. FFA: future forced air (cooled)
 - 6. FCAN: full capacity above normal
 - 7. FCBN: full capacity below normal
 - 8. MOV: metal oxide varistor
 - 9. Standard transformer: transformer kVA rating is at maximum temperature rise for a particular insulation class

1.5 QUALIFICATIONS

- A. The manufacturer of the core and coil shall procure all other transformer components, and shall assemble, factory test, and prepare the transformer for shipping.
- B. The transformer manufacturer shall have quality certification to ISO 9000:2000 or equivalent.

REFERENCE STANDARDS

- A. Comply with the following standards in effect at the time of bid submittal:

1. IEEE C2 National Electrical Safety Code.
2. IEEE 259-1999 IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General Purpose Transformers
3. IEEE C57 Family of Guides and Standards for Distribution, Power, and Regulating Transformers, with emphasis on the following:
 - a. IEEE C57.12.01-1998 IEEE Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin Encapsulated Windings
 - b. IEEE C57.12.70 IEEE Standard Terminal Markings and Connections for Distribution and Power Transformers
 - c. IEEE C57.12.80 IEEE Standard Terminology for Power and Distribution Transformers
 - d. IEEE C57.12.91 IEEE Standard Test Code for Dry-Type Distribution and Power Transformers
 - e. IEEE C57.96-1999 IEEE Guide for Loading Dry-Type Distribution and Power Transformers
 - f. IEEE C57.105-1978 (R1999) IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems
 - g. IEEE C57.110-1998 IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents
4. NEMA Standard ST-20
5. NEMA Standard TP-1 for Energy-Efficient Transformers
6. NEMA Standard TP-2 for Test Requirements For Energy Efficient Transformers
7. NFPA 70 National Electrical Code 2005
8. UL Standard 1561
9. Other applicable NRTL Standards

1.7 ENVIRONMENTAL CONDITIONS

A. Environmental conditions:

1. Conform to temperature range, humidity range, and elevation specified in Division 16 Section "Electrical - General".

1.8 SUBMITTALS

A. Submittals shall conform to the General and Special Provisions.

- ##### B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.

- C. Shop Drawings
 - 1. Compliance Statement
 - 2. Specially prepared shop drawings including the following:
 - a. Equipment nameplate data and electrical ratings
 - b. Weights and overall dimensions
 - c. General arrangement, section view, and sub-assembly drawings cross-indexed to a complete bill of materials listing all components and part numbers
 - d. Connection diagrams and details.
 - e. Location of field wiring & conduit connections
- D. Plans, elevations, sections, and details showing installation dimensions, required clearances for access, operation and maintenance, installation details, and special instructions.
- E. Product Data Sheets
 - 1. Technical data sheets, marked to show equipment selected for this project.

1.9 QUALITY ASSURANCE

- A. Quality Certification: The transformer manufacturer shall have quality certification to ISO 9000:2000 or an equivalent Quality Management System acceptable to the Engineer. Evidence of certification shall be submitted with equipment shop drawings.
- B. Comply with NFPA 70 National Electrical Code requirements, and Reference Standards listed herein.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton / Cutler-Hammer
 - 2. General Electric
 - 3. Square D / Groupe Schneider NA

2.2 DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS

- A. Dry type distribution transformer[s] shall have the following ratings:
 - 1. kVA ratings as shown on the Drawings, 30 deg. C average, 40 deg. C max. ambient air temperature in accordance with IEEE C57.96-1999
 - 2. 220 deg. C standard insulation system for indoor transformers.

3. Insulation Temperature Rise: maximum 115 deg C, maximum rise above 40 deg C., energy-efficient type.
 4. Voltage ratings as shown on the drawings.
 5. NEMA 2 painted steel enclosure for indoor locations, NEMA 3R painted steel enclosure for outdoor loadcenter locations.
- B. Dry-type two-winding transformers shall be in compliance with applicable portions of NEMA ST 20, IEEE C57.12.01, and UL 1562.

- C. Dry-type two-winding transformer minimum efficiencies shall comply with NEMA TP1 Table 4-2 requirements. A portion of the Table 4-2 is shown below for reference:

Single Phase kVA	Efficiency	3 Phase kVA	Efficiency
15	97.7%	15	97.0%
25	98.0%	30	97.5%

- D. Primary and Secondary Connections: Air terminal compartment with removable door. Tin-plated copper bar with predrilled NEMA spade terminals.
- E. Insulation Materials: IEEE C57.12.01, NEMA ST20, non-hygroscopic, thermosetting varnish for indoor transformers, non-hygroscopic vacuum pressure impregnated epoxy for outdoor loadcenter transformers.
- F. Core and Coil Assemblies: Transformer coils shall be copper wound on a core of electrical grade steel with high magnetic permeability and insulated laminations. Core and coil assembly shall be mounted on a structural steel base, which shall be isolated from the rest of the structure by vibration pads.
- G. Grounding: Provide equipment grounding terminal welded to the core support structural steel. Provide tin-plated braided copper grounding jumpers between the core and coil assembly and the enclosure ground. Provide tin-plated secondary neutral terminal with provisions for connecting a grounding electrode conductor directly to the neutral terminal, and a copper bonding jumper to the transformer equipment (enclosure) ground.
- H. The maximum temperature of the top of the enclosure shall not exceed 50 deg. C rise above 40 deg. C ambient.
- I. Enclosure shall be fabricated from heavy gauge steel, cleaned, degreased, primed and painted with electrostatic process polyester powder coat, ANSI 61 light gray.

2.3 QUALITY ASSURANCE

- A. Factory Tests: Perform design and routine tests according to standards specified for components. Conduct transformer tests according to NEMA ST-20 for standard transformers, and NEMA ST-20 and TP2 for energy-efficient transformers.

2.3 TOUCHUP PAINT

- A. Furnish 0.5 pint (250 mL) of touchup paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of conduits and grounding systems to verify the following:
 - 1. Wiring entries comply with layout requirements.
 - 2. Entries are within conduit-entry tolerances specified by manufacturer and wiring will not have to cross section barriers to reach load or line lugs.
- B. Examine walls, floors, roofs, and concrete equipment pads for suitable mounting conditions where transformers will be installed.
- C. Verify that equipment grounding conductors are in place and that requirements in Division 16 Section "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at transformer.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Store transformers in clean dry indoor rooms with a temporary dehumidifier and electric heating to maintain the storeroom between 5 and 40 deg. C with humidity less than 90%. Comply with manufacturer's additional written instructions for storing and periodic inspection and testing.
- B. Transformers shall be megger-tested monthly during storage. Units that have absorbed excessive moisture due to poor humidity and temperature control shall be returned to the manufacturer for drying-out and re-establishing acceptable megger test values at no additional cost to the Owner.

3.3 INSTALLATION

- A. Transformers 75 kVA and larger shall be floor-mounted on concrete equipment pads. 45 kVA and smaller transformers shall be floor-, wall-, or ceiling-mounted, as shown on the Drawings. Loadcenter transformers shall be mounted inside the loadcenters.
 - 1. Construct concrete equipment pads of dimensions indicated, but not less than 2 inches larger in both directions than supported unit and 4 inches high.
 - 2. Use 3000-psi , 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete.
 - 3. Install dowel rods to connect concrete equipment pads to structural concrete floor. Unless otherwise indicated on the Drawings, install dowel rods on 12-inch centers around full perimeter of pad. Install epoxy anchor bolts for supported equipment.
 - 4. Place and secure anchorage devices. Use equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

- B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and the NEC.

3.4 CONNECTIONS

- A. Ground equipment in conformance with Division 16 Section "Grounding and Bonding".
- B. Connect wiring in conformance with Division 16 Section "Wire and Cable".
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

-- END OF SECTION --

SECTION 262923**VARIABLE FREQUENCY CONTROLLERS****PART 1 – GENERAL****1.1 SUMMARY**

- A. Provide Variable Frequency Controllers (VFCs) in compliance with this Section for motors that drive mechanical equipment specified in other Divisions of the specifications.

1.2 RELATED DOCUMENTS

- A. Drawings and General and Special Provisions apply to this Section.

1.3 QUALIFICATIONS

- A. The variable frequency drive controller shall be designed, assembled, factory-tested, setup and commissioned by the AC converter – DC link – variable frequency AC inverter manufacturer.

1.4 DEFINITIONS

- A. In addition to the definitions in Division 16 Section “General Provisions,” the following definitions apply to this Section:
 - 1. AC: Alternating Current
 - 2. BMS: Building Management Systems
 - 3. Converter: Converts AC to DC
 - 4. DC: Direct Current
 - 5. HP: Horsepower
 - 6. I/O: Input / Output
 - 7. IGBT: Insulated gate bipolar transistor.
 - 8. Inverter: Converts DC to AC
 - 9. MCC: Motor Control Center
 - 10. PWM: Pulse-Width Modulated.
 - 11. Point of Analysis: with reference to IEEE 519, the point of common coupling selected by the Engineer
 - 12. TDD: Total Demand Distortion as defined in IEEE 519
 - 13. THD: Total Harmonic Distortion as defined in IEEE 519

1.5 REFERENCE STANDARDS

- A. Comply with the following standards in effect at the time of bid submittal unless otherwise noted in Division 1:
 - 1. IEEE 519 IEEE Recommended Practices & Requirements for Harmonic Controls in Electrical Power Systems
 - 2. NEMA FU 1 Low Voltage Cartridge Fuses
 - 3. NEMA ICS 6 Industrial Control and Systems Enclosures
 - 4. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

5. NEMA MG 1 Motors and Generators
6. NEMA MG 10 Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors.
7. NFPA 70 National Electrical Code
8. UL 198C High-Interrupting-Capacity Fuses, Current-Limiting Types
9. UL 50 Safety Enclosures for Electrical Equipment
10. UL 508 Industrial Control Equipment

1.6 SUBMITTALS

- A. Submittals shall be in conformance with the General and Special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.
- C. Shop Drawings
 1. Specially prepared shop drawings including the following:
 - a. Equipment nameplate data and electrical ratings
 - b. Weights and overall dimensions
 - c. General arrangement, plan view, section view, elevation, and sub-assembly drawings cross-indexed to a complete bill of materials listing all components and part numbers. Include layout of door-mounted components. Show conduit entry areas and field wiring termination points.
 - d. Three-line AC power schematic diagrams.
 - e. Control schematic showing all control devices.
 - f. Field wiring diagrams showing each external device connected.
 - g. Installation instruction including details, required clearances for access, operation and maintenance, and special instructions for unloading and hoisting, short term and long term storage, and unpacking.
- C. Product Data Sheets
 1. Technical data sheets for manufactured equipment and sub-assemblies, marked to show equipment selected for this project. Include product data sheets in Shop Drawing submittal.
- D. Test Reports
 1. Factory test reports
 2. Acceptance test reports
- E. Manufacturer's Field Reports

1. Inspection of equipment installation (prior to energization and startup) report
 2. Complete tabulation of equipment settings and adjustments, and functional testing report
- F. Operation and Maintenance Data
1. Operation and Maintenance Instructions: For equipment and accessories, including pre-energization tests and checks, initial startup procedure, manufacturer's written instructions for testing and adjusting overcurrent protective devices, exploded views of major assemblies and sub-assemblies indexed to parts lists, maintenance instructions and recommended maintenance intervals, troubleshooting procedures, and contact details for spare parts purchase and technical support.
- G. Closeout Submittals
1. Follow up service reports
 2. Warranty

1.7 QUALITY ASSURANCE

- A. All VFCs for this project shall be supplied by the same manufacturer.
- B. VFC sizing shall be based on the nameplate data for the motor selected by the mechanical equipment supplier to operate at variable frequency over the specified speed range. Where shown on the drawings VFC's being used as single to three phase conversion drives shall be increased in size as to provide the required output to serve the motor utilized.
- C. Quality Certification: The variable frequency drive motor controllers manufacturer shall have quality certification to ISO 9000:2000. Evidence of certification shall be submitted with equipment shop drawings.
- D. Compliance with the Specification: Clearly list Specification non-conformances on the shop drawing transmittal letter. Furnish controllers as approved on shop drawing submittals.
- E. Technical Support: The manufacturer shall maintain a service center capable of providing training, parts, and emergency maintenance and repairs within 200 miles of Project site.
- F. Safety in the Workplace: Provide NRTL-listed and labeled electrical components as defined in NEC Article 100, by an NRTL acceptable to the AHJ.

1.8 PROJECT CONDITIONS

- A. Ambient temperature, humidity, and elevation: Equipment shall be rated for continuous operation, capable of driving full load without de-rating, within the ambient temperature, humidity, and elevation ranges specified in Division 16 Section "Electrical General Provisions."
- B. Equipment shall be suitable for operation under the service conditions listed in Division 16 Section "Electrical - General" and long-term exposure to low levels of hydrogen sulfide typical of wastewater facilities.

1.9 COORDINATION

- A. The Contractor is required to coordinate selection of variable frequency controller and motor to match equipment provided under other Sections in order to meet the Specification requirements for a complete and fully functional system.
- B. For freestanding enclosures, coordinate size and location of concrete equipment pads with the work of other trades in the area. Use afterset epoxy anchors to anchor equipment to concrete pads unless otherwise instructed by the equipment manufacturer. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Coordinate output current and motor full load current ratings with equipment provided under other Sections of the Specification.
- D. Provide VFC-to-motor wire size and length data to the VFC manufacturer prior to shop drawing submittal so that the VFC manufacturer can include accessory devices, such as output line reactors and motor termination DV/DT reduction devices that may be necessary to limit the impulse voltage at the motor to values within the inverter-duty motor insulation impulse voltage rating specified in Division 15 Section "Electric Motors".
- E. Coordinate controller interfaces with pilot devices and control and signal circuits furnished under Division 17. Follow the VFC manufacturer's recommendations for power, control, and signal cable separation and related installation details.

PART 2 – PRODUCTS

2.1 EQUIPMENT AND COMPONENTS

- A. Materials, equipment, and devices shall be NRTL-listed, and shall comply with NFPA 70 National Electrical Code requirements.
- B. Indoor enclosures shall be NEMA 1 painted steel. Outdoor enclosures shall be NEMA 4 stainless steel painted white with sun shields and with air conditioning for heat dissipation.

2.2 MANUFACTURERS

- A. Available variable frequency motor controllers manufacturers: Subject to compliance with harmonic distortion limits, manufacturers include the following:
 1. Rockwell Automation Inc. / Allen Bradley
 2. Eaton Corporation / Cutler Hammer
 3. Square D Company
 4. Or Approved Equal as determined by the Owner/Engineer.

2.3 GENERAL DESCRIPTION:

- A. Solid-state constant-torque VFC and accessories with full-wave diode bridge AC-to-DC converter, and PWM-type IGBT output, with accessories as specified herein, listed and labeled as a complete unit and arranged to provide variable speed control of a NEMA Design B, 3-phase squirrel-cage induction motor by adjusting output voltage and frequency while maintaining a constant volts/hertz ratio.
- B. 6-pulse Controller: Controllers shall be six-pulse type (six pulses during a single cycle of the three-phase current).

- C. 18 Pulse Controller: Controllers shall be solid state constant torque 18 pulse type (number pulses during a single cycle of the three phase voltage) The motor controllers shall be phase-shifting type meeting the allowable current distortion limits for the 5th, 7th, 11th, and 13th harmonics in accordance with IEEE Standard 519 Table 10.3 without any additional harmonic filters. All components including phase shifting transformers, filters, etc. shall be mounted in the variable frequency motor controller enclosure, and shall be factory wired and tested as a complete system.

2.4 DRIVE PERFORMANCE REQUIREMENTS

- A. The VFC shall control the motor speed over the range of 25 percent to 100 percent of base speed without motor forced-cooling accessories.
- B. Provide VFC output line voltage conditioning devices such as output reactors, output filters, and motor termination filters, to reduce impulse voltage at the motor terminals to values acceptable for operation of inverter-duty motors having 1500 volt 1 microsecond impulse voltage as defined by NEMA MG 1.

2.5 CONTROLLER PERFORMANCE REQUIREMENTS:

- A. Controllers shall be designed for operation with the following performance:
 1. Minimum Efficiency: 95 percent at 60 Hz, full load.
 2. Minimum Displacement Power Factor: 95 percent.
 3. Overload Capability: 110% of continuous current output for 60 seconds; 150% of continuous current output for 3 seconds.
 4. Starting Torque: Provide starting boost up to 150%
 5. Speed Regulation: Plus or minus 1 percent without tachometer feedback.
- B. Controllers shall be equipped with the following internal adjustable functions:
 1. Minimum Speed: 5 to 25 percent of maximum rpm.
 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 3. Acceleration Ramp: 2 to 22 seconds.
 4. Deceleration Ramp: 2 to 22 seconds.
 5. Current Limit: 50 to a minimum of 110 percent of maximum rating.
 6. Slip Compensation: adjustable
 7. Skip frequency bands: minimum of three to avoid mechanical equipment critical frequencies
 8. Carrier frequency: adjustable
- C. Controllers shall have the following self-protection and reliability features:

1. Input transient voltage protection by means of NRTL-listed transient voltage surge suppressors designed to limit transient over-voltages to acceptable limits for controller reliability. Provide metal enclosure for TVSS and minimize length of wire lead connections to incoming line terminals.
2. Under- and over-voltage trips; inverter over-temperature, overload, and over-current trips.
3. Motor Overload Relay: Adjustable and capable of NEMA 250, Class 10 performance for submersible pump motors and Class 20 performance for standard NEMA frame motors.
4. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
5. Instantaneous line-to-line and line-to-ground over-current trips.
6. Loss-of-phase protection.
7. Short-circuit protection.
8. Motor over-temperature fault (for motors specified with over-temperature protection).
9. Historical Logging Information and Displays:
 - a. Real-time clock with current time and date.
 - b. Running log of total power versus time.
 - c. Total run time.
 - d. Fault log, maintaining last four faults with time and date stamp for each.

2.6 CONTROLLER ACCESSORIES

- A. The following accessories shall be provided:
 1. Integral fused disconnect:
 - a. Motor-rated fused disconnect switch with external flange-mounted operating handle, padlockable in the OFF position
 - b. Current limiting fuses rated 200,000 AIC, specifically for applications requiring protection of solid-state electronic power components.
 2. Five percent incoming line reactor
 3. VFC Output Filtering: Provide output line reactors and filtering devices (at motors) for limiting voltage at motor terminal at VFC carrier frequencies to less than the motor impulse voltage rating, if required for the drive application.

2.7 SPECIAL APPLICATIONS

- A. Reduced Frequency Output: Reduce motor speed without shutting down VFC during voltage sags and brownouts when VFC input voltage is below normal operating range of VFC.
- B. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction.

2.8 FRONT-OF-ENCLOSURE MOUNTED DEVICES:

- A. Provide the following devices mounted on the door of the controller enclosure:
1. Status Lights: Door-mounted LED indicators shall indicate the following conditions:
 - a. Power on
 - b. Motor Running
 - c. Fault
 2. Operator Control Station:
 - a. LOCAL-OFF-REMOTE selector switch for start-stop commands
 - b. LOCAL-REMOTE selector switch for speed reference signals
 - c. Red START and green STOP pushbuttons
 - d. Red RUNNING and green STOPPED indicator lights
 - e. Black RESET pushbutton with shroud for variable frequency fault reset.
 - f. Black RESET pushbutton for motor overload relay reset (if constant speed bypass is provided).
 - g. Local speed control potentiometer or keypad RAISE – LOWER speed control.
 3. Indicating Devices: Flush-mounted panel meters or digital readout devices to indicate the following controller parameters:
 - a. Output frequency (Hz).
 - b. Motor speed (rpm).
 - c. Motor status (running, stop, and fault).
 - d. Motor current (amperes).
 - e. Motor torque (percent).
 - f. Fault or alarm status (code).
 - g. Speed feedback signal (percent).
 - h. DC-link voltage (VDC).
 - i. Set-point frequency (Hz).
 - j. Output voltage (V).

2.9 CONTROLS INTERFACE:

- A. Remote START and STOP commands shall be Form C (SPDT) dry contacts that close to start the VFD and open to stop it.
- B. Remote Signal Inputs: Accept any of the following speed input commands from remote control systems specified in other Divisions:
1. 0 to 10 V dc.
 2. 4-20 milliamp DC.
 3. Potentiometer
 4. Raise-Lower speed digital inputs.
 5. RS485.
- D. Output Signal Interface:
1. A minimum of one isolated analog output signal (4-20 milliamp DC), which can be programmed to any of the following:

- a. Output frequency (Hz).
 - b. Output current (load).
 - c. Motor torque (percent).
 - d. Motor speed (rpm).
 - e. Set-point frequency (Hz).
- E. Remote Status and Alarm Indication Interface: A minimum of one Form C 10 amp 120 V AC dry circuit relay outputs for remote indication of each of the following:
 - 1. RUNNING status (forward and reverse)
 - 2. Controller READY (controller LOCAL-OFF-REMOTE selector switch is in REMOTE, and control power is on, and controller is available for normal operation)
 - 3. SHUTDOWN on fault condition
 - 4. FAULT
- F. Digital Communications Interface: Provide an RS485 interface allowing VFC to be used with an external system within a multi-drop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control. Provide capability for VFC to retain these settings within the nonvolatile memory.

2.10 FACTORY TEST

- A. Each controller shall be factory tested at rated full load current and an ambient temperature of 40 degrees C for a period of not less than 24 hours. If a component fails, it shall be replaced and the test shall be repeated for the full time period.
- B. A certified copy of the factory Test Report shall be furnished to the Engineer prior to shipping the controller to the job site.

2.11 WARRANTY

- A. Provide parts and labor warranty in accordance with Division 1. In the absence of more stringent warranty requirements, equipment furnished under this Section shall have a minimum 1 year on-site parts and labor warranty.
- B. Include contact details (names, addresses, telephone and fax numbers, and email if available) for warranty callbacks with the manufacturer's installation, operation, and maintenance instruction submittal.
- C. The manufacturer's standard warranty shall apply in cases where the standard warranty is more favorable to the Owner than the minimum warranty described in Division 1.

PART 3 – EXECUTION

3.1 EXAMINATION PRIOR TO INSTALLATION

- A. Inspect areas prepared for VFC installation for compliance with manufacturer's installation instructions, installation tolerances, NEC working clearances, and other conditions affecting performance.

- B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. For freestanding enclosures, anchor each VFC assembly to a concrete equipment pad in accordance with the VFC manufacturer's installation instructions. Attach with stainless steel bolts.

3.3 CONCRETE BASES

- A. Coordinate size and location of concrete equipment pad with manufacturer's installation instructions for approved equipment.
- B. Concrete materials and installation requirements are specified in Division 3.

3.4 IDENTIFICATION

- A. Identify VFCs, components, and control wiring according to Division 16 Section "Electrical Identification".
- B. Operating Instructions: Mount engraved plastic sign with simplified normal and emergency operating instructions, including constant speed operation, on front of VFC enclosure five feet above finished floor. Sign shall have white letters on black field. Lettering shall be 1/4-inch minimum height.

3.5 ACCEPTANCE TESTING

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to assist in acceptance testing.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports.
 - 1. Perform electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specifications, Section 7.17 Adjustable Speed Drive Systems. Certify compliance with test parameters.
 - 2. Replace damaged and malfunctioning controls and equipment.
- C. Remove malfunctioning units, replace with new units, and retest as specified above.
- D. Test Reports: Prepare written reports to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective actions taken to achieve compliance with requirements.

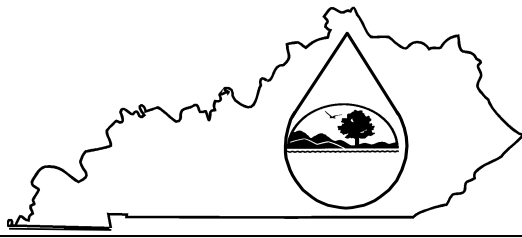
3.6 DEMONSTRATION AND TRAINING

- A. Engage the services of a factory-authorized service representative to train Owner's maintenance personnel.
- B. Upon completion of the work and at a time designated by the Owner, the equipment manufacturer's authorized representative shall instruct the Owner's personnel in the programming, operation, and maintenance of each type of variable frequency motor controller.
- C. A proposed training course schedule and a complete description of each day's training syllabus, hour-by-hour, shall be submitted to the Owner and the Engineer at least 30 days in advance of the proposed training date. All pages of the manufacturer's instructions and recommendations for maintenance, troubleshooting, and parts replacement shall be reviewed during the training course.

-- END OF SECTION --

DIVISION 31
EARTHWORK

KPDES FORM NOI-SW



Kentucky Pollutant Discharge Elimination System
 (KPDES)
Notice of Intent (NOI)
for Storm Water Discharges
Associated with Industrial Activity Under the
KPDES General Permit

Submission of this Notice of Intent constitutes notice that the party identified in Section I of this form intends to be authorized by a KPDES permit issued for storm water discharges associated with industrial activity. Becoming a permittee obligates such discharger to comply with the terms and conditions of the permit.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM (See Instructions on back)

I. Facility Operator Information

Name:		Phone:	
Address:		Status of Owner/Operator:	
City, State, Zip Code:			

II. Facility/Site Location Information

Name:			
Address:			
City, State, Zip Code:			
County:			
Site Latitude: (degrees/minutes/seconds)		Site Longitude: (degrees/minutes/seconds)	

III. Site Activity Information

MS4 Operator Name:				
Receiving Water Body:				
Are there existing quantitative data?	Yes <input type="checkbox"/>	If Yes, submit with this form.		
	No <input type="checkbox"/>			
SIC or Designated Activity Code Primary		2nd	3rd	4th
If this facility is a member of a Group Application, enter Group Application Number:				
If you have other existing KPDES Permits, enter Permit Numbers:				

IV. Additional Information Required FOR CONSTRUCTION ACTIVITIES ONLY

Project Start Date:		Completion Date:	
Estimated Area to be disturbed (in acres):			
Is the Storm Water Pollution Prevention Plan in Compliance with State and/or Local Sediment and Erosion Plans?	Yes <input type="checkbox"/> No <input type="checkbox"/>		

V. Certification: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed or Typed Name:			
Signature:		Date:	

**Kentucky Pollutant Discharge Elimination System (KPDES)
Instructions
Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity
To Be Covered Under The KPDES General Permit**

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a storm water discharge must submit a NOI to obtain coverage under the KPDES Storm Water General Permit. If you have questions about whether you need a permit under the KPDES Storm Water program, or if you need information as to whether a particular program is administered by the state agency, call the **Storm Water Contact, Industrial Section, Kentucky Division of Water at (502) 564-3410.**

WHERE TO FILE NOI FORM

NOIs must be sent to the following address:

**Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
Frankfort Office Park
14 Reilly Road
Frankfort, KY 40601**

COMPLETING THE FORM

Type or print legibly in the appropriate areas only. If you have any questions regarding the completion of this form call the **Storm Water Contact, Industrial Section, at (502) 564-3410.**

SECTION I - FACILITY OPERATOR INFORMATION

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same as the name of the facility. The responsible party is the legal entity that controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Enter the appropriate letter to indicate the legal status of the operator of the facility.

F = Federal M = Public (other than federal or state)
S = State P = Private

SECTION II - FACILITY/SITE LOCATION INFORMATION

Enter the facility's or site's official or legal name and complete street address, including city, state, and ZIP code.

SECTION III - SITE ACTIVITY INFORMATION

If the storm water discharges to a municipal separate storm sewer system (MS4), enter the name of the operator of the MS4 (e.g., municipality name, county name) and the receiving water of the discharge from the MS4. (A MS4 is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by a state, city, town, borough, county, parish, district, association, or other public body which is designed or used for collecting or conveying storm water.)

If the facility discharges storm water directly to receiving water(s), enter the name of the receiving water.

Indicate whether or not the owner or operator of the facility has existing quantitative data that represent the characteristics and concentration of pollutants in storm water discharges. If data is available submit with this form.

List, in descending order of significance, up to four 4-digit standard industrial classification (SIC) codes that best describe the principal products or services provided at the facility or site identified in Section II of this application.

If the facility listed in Section II has participated in Part 1 of an approved storm water group application and a group number has been assigned, enter the group application number in the space provided.

If there are other KPDES permits presently issued for the facility or site listed in Section II, list the permit numbers.

SECTION IV - ADDITIONAL INFORMATION REQUIRED FOR CONSTRUCTION ACTIVITIES ONLY

Construction activities must complete Section IV in addition of Sections I through III. Only construction activities need to complete Section IV.

Enter the project start date and the estimated completion date for the entire development plan.

Provide an estimate of the total number of acres of the site on which soil will be disturbed (round to the nearest acre).

Indicate whether the storm water pollution prevention plan for the site is in compliance with approved state and/or local sediment and erosion plans, permits, or storm water management plans.

SECTION V - CERTIFICATION

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, state, Federal, or other public facility: by either a principal executive officer or ranking elected official.

KPDES FORM NOT-SW

	<p>Kentucky Pollutant Discharge Elimination System (KPDES)</p> <p>NOTICE OF TERMINATION (NOT) of Coverage Under the KPDES General Permit for Storm Water Discharges Associated with Industrial Activity</p>
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Submission of this Notice of Termination constitutes notice that the party identified in Section II of this form is no longer authorized to discharge storm water associated with industrial activity under the KPDES program.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.
(Please see instructions on back before completing this form.)

I. PERMIT INFORMATION

KPDES Storm Water General Permit Number:
Check here if you are no longer the Operator of the Facility: <input type="checkbox"/>
Check here if the Storm Water Discharge is Being Terminated: <input type="checkbox"/>

II. FACILITY OPERATOR INFORMATION

Name:
Address:
City/State/Zip Code:
Telephone Number:

III. FACILITY/SITE LOCATION INFORMATION

Name:
Address:
City/State/Zip Code:

Certification: I certify under penalty of law that all storm water discharges associated with industrial activity from the identified facility that are authorized by a KPDES general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity of waters of the Commonwealth is unlawful under the Clean Water Act and Kentucky Regulations where the discharge is not authorized by a KPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Kentucky Revised Statutes.

NAME (Print or Type)	TITLE
SIGNATURE	DATE

INSTRUCTIONS
NOTICE OF TERMINATION (NOT) OF COVERAGE UNDER THE KPDES GENERAL PERMIT
FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY

Who May File a Notice of Termination (NOT) Form

Permittees who are presently covered under the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Storm Water Discharges Associated with Industrial Activity may submit a Notice of Termination (NOT) form when their facilities no longer have any storm water discharges associated with industrial activity as defined in the storm water regulations at 40 CFR 122.26 (b)(14), or when they are no longer the operator of the facilities.

For construction activities, elimination of all storm water discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with industrial activity from the construction site that are authorized by a KPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles have been employed.

Where to File NOT Form

Send this form to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
14 Reilly Road, Frankfort Office Park
Frankfort, KY 40601

Completing the Form

Type or print legibly in the appropriate areas and according to the instructions given for each section. If you have questions about this form, call the Storm Water Contact, Industrial Section, at (502) 564-3410.

Section I - Permit Information

Enter the existing KPDES Storm Water General Permit number assigned to the facility or site identified in Section III. If you do not know the permit number, **call the Storm Water Contact, Industrial Section at (502) 564-3410.**

Indicate your reason for submitting this Notice of Termination by checking the appropriate box:

If there has been a change of operator and you are no longer the operator of the facility or site identified in Section III, check the corresponding box.

If all storm water discharges at the facility or site identified in Section III have been terminated, check the corresponding box.

Section II - Facility Operator Information

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Section III - Facility/Site Location Information

Enter the facility's or site's official or legal name and complete address, including city, state and ZIP code. If the facility lacks a street address, indicate the state, the latitude and longitude of the facility to the nearest 15 seconds, or the quarter, section, township, and range (to the nearest quarter section) of the approximate center of the site.

Section IV - Certification

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, State, Federal, or other public facility: by either a principal executive

SECTION 311000**SITE CLEARING****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. Clear site within construction limits of plant life.
- B. Remove grass and topsoil in area of access road and foundation.
- C. Remove root system of trees and shrubs.
- D. Remove surface debris

1.02 RELATED WORK

- A. SECTION 312317 - Rock Removal.
- B. SECTION 312213 - Rough Grading.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable local codes and ordinances for disposal of debris.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION**3.01 CLEARING**

- A. Clear areas required for access to site and execution of work.
- B. Remove trees, shrubs, brush, and other vegetable matter such as snags, bark, and refuse.

3.02 PROTECTION

- A. The Contractor shall not cut or injure any trees or other vegetation outside the easement lines and outside the areas to be cleared, as indicated on the Drawings, without written permission from the Engineer. The Contractor shall be responsible for all damage done outside these lines.

3.03 GRUBBING

- A. From areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of at least 24 inches below subgrade elevation all roots larger than 1 1/2 in. in diameter, and remove to a depth of 12 in. all roots larger than 1/2 in. in diameter. Such depths shall be measured from the existing ground surface, the proposed finished grade or subgrade, whichever is lower.

3.04 STRIPPING

- A. All stumps, roots, foreign matter, topsoil, loam, and unsuitable earth shall be stripped from the ground surface. The topsoil and loam shall be utilized insofar as possible, for finished surfacing. Loam shall not be taken from the site.

3.05 DISPOSAL

- A. All material resulting from clearing and grubbing and not scheduled for reuse or stockpiling shall become the property of the Contractor and shall be suitably disposed of off site, unless otherwise directed by the Engineer, in accordance with all applicable laws, ordinances, rules and regulations.
- B. Such disposal shall be performed as promptly as possible after removal of the material and shall not be left until the final period of cleaning up.

3.06 FENCES

- A. Wherever fences need to be removed to provide access to the work or are damaged during the progress of work, they shall be restored or repaired to as good a condition as existed prior to construction at the Contractor's expense.

-- END OF SECTION --

SECTION 311400**STRIPPING****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. This Section includes the requirements for stripping designated area(s) as shown on the Contract Drawings. The work shall consist of the excavation and removal of all topsoil, organic and other unsuitable matter at the location(s) and to the stripping limits required by the work shown on the Contract Drawings.

1.02 REFERENCES

Not Used.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

- A. The area(s) designated for stripping shall be stripped to a depth of six (6) inches.
- B. Stripped material shall be stockpiled at designated areas for later use or removed from the site.
Stripped material stockpiles shall be enclosed by silt fence.
- C. Objectionable materials encountered during the stripping operation shall be removed from the site and be legally disposed of.
- D. The Contractor shall be responsible for compliance with all Federal, State and local laws and regulations relative to disposal by removal, and for obtaining all necessary permits and payment of fees for removal or disposal.

- END OF SECTION -

SECTION 312000**EARTHWORK****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Extent of earthwork is indicated on the Drawings.
 - 1. Preparation of subgrade for pavements is included as part of this work.
 - 2. Engineered fill for support of building or basin slabs is included as part of this work.
 - 3. Backfilling of tanks, basins, basements and trenches within building line is included as part of this work.
- B. Excavation for Mechanical/Electrical Work: Excavation and backfill required in conjunction with underground mechanical and electrical utilities, and buried mechanical and electrical appurtenances is included as work of this Section.
- C. Definition: "Excavation" consists of removal of all material encountered to subgrade elevations and subsequent disposal or reuse of materials removed.

1.02 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. American Society for Testing and Materials (ASTM)
 - a. A328 Specification for Steel Sheet Piling
 - b. D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³)
 - c. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
 - d. D1760 Specification for Pressure Treatment of Timber Products
 - e. D2922 Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

1.03 DEFINITIONS

- A. Excavation (or Trenching)
 - 1. Grubbing, stripping, removing, storing and rehandling of all materials of every name and nature necessary to be removed for all purposes incidental to the construction and completion of all the work under construction.
 - 2. All sheeting, sheetpiling, bracing and shoring, and the placing, driving, cutting off and removing of the same.

3. All diking, ditching, fluming, cofferdamming, pumping, bailing, draining, well pointing, or otherwise disposing of water.
 4. The removing and disposing of all surplus materials from the excavations in the manner specified.
 5. The maintenance, accommodation and protection of travel and the temporary paving of highways, roads and driveways.
 6. The supporting and protecting of all tracks, rails, buildings, curbs, sidewalks, pavements, overhead wires, poles, trees, vines, shrubbery, pipes, sewers, conduits or other structures or property in the vicinity of the work, whether over- or underground or which appear within or adjacent to the excavations, and the restoration of the same in case of settlement or other injury.
 7. All temporary bridging and fencing and the removing of same.
- B. Earth
1. All materials such as sand, gravel, clay, loam, ashes, cinders, pavements, muck, roots or pieces of timber, soft or disintegrated rock, not requiring blasting, barring, or wedging from their original beds, and specifically excluding all ledge or bedrock and individual boulders or masonry larger than one-half cubic yard in volume.
- C. Backfill
1. The refilling of excavation and trenches to the line of filling indicated on the Contract Drawings or as directed using materials suitable for refilling of excavations and trenches; and the compacting of all materials used in filling or refilling by rolling, ramming, watering, puddling, etc., as may be required.
- D. Spoil
1. Surplus excavated materials not required or not suitable for backfills or embankments.
- E. Embankments
1. Fills constructed above the original surface of the ground or such other elevation as specified or directed.
- F. Limiting Subgrade
1. The underside of the pipe barrel for pipelines
 2. The underside of footing lines for structures
- G. Excavation Below Subgrade
1. Excavation below the limiting subgrades of structures or pipelines.
 2. Where materials encountered at the limiting subgrades are not suitable for proper support of structures or pipelines, the Contractor shall excavate to such new lines and grades as required.

1.04 RELATED WORK

- A. Dewatering is included in elsewhere in this specification.
- B. Erosion and sedimentation control is included in this Division, Section 312500, SPECIAL CONDITIONS, SC-40.
- C. Yard piping is included in this Division, Section 331413.
- D. Seeding is included in this Division, Section 329200.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Service: The Owner shall engage the services of a qualified geotechnical engineering, inspection, and testing firm for quality control testing during earthwork operations.

1.06 SUBMITTALS

- A. Test Reports - Excavating: Copies of all test reports and field reports shall be made available to the Owner and the Engineer.
- B. The Contractor shall provide access to site areas, borrow pits and other areas for testing. The Contractor shall also indicate the need for tests to be performed. The Contractor may prepare any tests necessary for the conduct of his work.

1.07 JOB CONDITIONS

- A. Site Information:
 - 1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretation or conclusions drawn therefrom by Contractor. Data are made available for convenience of Contractor.
 - 2. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
 - 3. A geotechnical investigation has not been carried out at the site.
- B. Existing Utilities: Prior to commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations where required.
- C. Use of Explosives: SPECIAL CONDITIONS, SC-37
- D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
 - 1. Operate warning lights as recommended by authorities having jurisdiction.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS - DEFINITIONS

- A. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
- B. Drainage Fill: Washed, uniformly graded mixture of crushed stone or crushed gravel conforming to No. 57 of Kentucky Department of Highways Standard Specifications.
- C. Backfill and Non-Structural Fill Materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter. No. 57 stone is also used as backfill material at selected structures.
- D. Granular Structural Fill: Granular structural fill shall be used in areas where indicated in this specification. Granular structural fill shall consist of a crushed stone conforming to gradation requirements of Kentucky Department of Highways and having less than 5% passing the No. 200 sieve. Placing and compaction of the granular structural fill shall be in general accordance with Kentucky Department of Highways Standard Specifications and this specification.

2.02 FILTER FABRIC

- A. Material shall be non-woven polyester or polypropylene geotextile having an equivalent opening size no finer than U.S. Standard Sieve No. 200 and no coarser than a U.S. Standard Sieve No. 140.
- B. An acceptable product is Typar 3601 manufactured by the Dupont Corporation. Other equivalent products shall be submitted to the Engineer for review and approval prior to usage.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Excavation includes excavation to subgrade elevations including excavation of earth, rock, bricks, wood, cinders, and other debris. All excavation of materials shall be included in the lump sum portion of the work and will be UNCLASSIFIED AND NO ADDITIONAL PAYMENT WILL BE MADE REGARDLESS OF TYPE OF MATERIAL ENCOUNTERED.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.
 1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the Engineer.

2. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification.
 3. All material which slides, falls or caves into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense and no extra compensation will be paid the Contractor for any materials ordered for refilling the void areas left by the slide, fall or cave-in.
- C. Additional Excavation: When excavation has reached required subgrade elevations, notify the Geotechnical Engineer who will make an inspection of conditions. The surface of the excavated area shall be "proofrolled" with a loaded truck or other heavy construction equipment.
1. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavation deeper and replace excavated material as directed in writing by the Engineer.
 2. Removal of unsuitable material and its replacement as directed will be paid on basis of Contract conditions relative to changes in work.
- D. Stability of Excavations:
1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
 2. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- E. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.
1. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.
 2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
 3. Provide permanent steel sheet piling or pressure crested timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place. In the event the Owner directs the Contractor to leave shoring materials in place, the Owner will reimburse the Contractor for the reasonable cost of leaving such materials in place.
- F. Dewatering: It is anticipated that dewatering may be required at excavations.
- G. Material Storage:
1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
 2. Dispose of excess soil material and waste materials offsite at no additional cost to the Owner.
- H. Excavation for Structures

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
 2. In excavating for footings and foundations, take care not to disturb bottom of excavation. All loose material shall be removed from the excavation just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
 3. Protruding rock formations that would interfere with uniform footing bearing shall be removed such that the structure will bear upon uniform engineered fill at least 24 inches thick.
- I. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.
- J. Trench Excavation:
1. The Contractor shall include in his lump sum bid all trenching and backfill necessary for installation of all pipe as planned and specified. Trenching shall include clearing and grubbing of all trash, and debris encountered in the trenching. The Contractor shall dispose of such material offsite at no extra cost to the Owner.
 2. All existing facilities shall be protected from danger or damage while pipelines are being constructed and backfilled, and from damage due to settlement of the backfill.
 3. In the event any existing structure is damaged, repair and restoration shall be made at once and backfill shall not be replaced until this is done. Restoration and repair shall be such that the damaged structure is equal to or better than its original condition and can serve its purpose as completely as before. All such restoration and repair shall be done without extra cost to the Owner.
 4. Trenches must be dug to lines and grades shown on the Drawings. Hand trenching may be required in areas where machine trenching would result in undue damage to existing structures and facilities.
 5. Sheeting and shoring of trenches shall be provided at the expense of the Contractor where necessary to protect life, property and the new or existing structures from damage or to maintain maximum permissible trench widths at top of pipe. All necessary materials, including, but not limited to, sheeting, sheet piling, trench jacks, braces, shores and stringers, shall be used to hold trench walls. Sheeting and shoring may be withdrawn as the trenches are being backfilled, after backfill has been tamped over top of the pipe at least 18-inches. If removal before backfill is completed to surface endangers adjacent structures, such as buildings, pipelines, street paving, and sidewalks, then the sheeting and shoring shall be left in place until such danger has passed, and then pulled if practical. Voids caused by sheeting withdrawal shall be backfilled and tamped. If not withdrawn, sheeting shall be cut off at least 18-inches below final surface grade, so there is no obstruction at the ground level. In the event the Owner directs the Contractor to leave shoring materials in place, the Owner will reimburse the Contractor for the reasonable cost of leaving such materials in place.
 6. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the Engineer may order stabilization by various means.

Exclusive of dewatering normally required for construction, and instability caused by neglect of the Contractor, the payment necessary for stabilization shall be negotiated.

7. The location of the pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. The Owner reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The Owner is under no obligation to locate pipelines, so they may be excavated by machine.
8. The Contractor shall only have sufficient trench open ahead of the pipe laying work as necessary for the prosecution of the work, that day. Dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room. Provide a minimum of 9" clearance on both sides of pipe or conduit.
 - a. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
 - b. Where rock is encountered, carry excavation 6-inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.
 - c. For pipes or conduit 3-inches or less in nominal size and for flat-bottomed, multiple-duct conduit units, excavate to subbase depth indicated or, if not indicated, then to 4-inches below bottom of work to be supported.
 - d. For pipes or conduit 6-inches or larger in nominal size, and mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated or, if not otherwise indicated, to 6-inches below bottom of work to be supported.
 - e. Except as otherwise indicated, excavate for exterior water piping (water, drainage) so top of piping is no less than 3-feet 6-inches below finish grade.
 - f. Grade bottom of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
 - g. Encase pipe with concrete (full encasement) where trench excavations pass within 18 inches of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing(s).
 - h. Concrete is specified in Division 3.
 - i. Do not backfill trenches until tests and inspections have been made and backfilling authorized by the Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
 - j. For piping or conduit less than 3-feet 6-inches below surface of roadways, furnish and install steel casing pipe, minimum wall thickness of 5/16", of

sufficient diameter to carry the pipe or conduit to at least two feet beyond outside edge of pavement.

- K. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F (1°C).

3.02 REMOVAL OF WATER

A. General

1. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work or the proper placing of pipes, structures, or other work.
2. Unless otherwise specified, all excavations which extend down to or below the static groundwater elevations shall be dewatered by lowering and maintaining the groundwater beneath such excavations at all times when work thereon is in progress, during subgrade preparation and the placing of the structure or pipe thereon.
3. Water shall not be allowed to rise over or come in contact with any masonry, concrete or mortar, until at least 24 hours after placement, and no stream of water shall be allowed to flow over such work until such time as the Engineer may permit.
4. Where the presence of fine grained subsurface materials and a high groundwater table may cause the upward flow of water into the excavation with a resulting quick or unstable condition, the Contractor shall install and operate a well point system to prevent the upward flow of water during construction.
5. Water pumped or drained from excavations, or any sewers, drains or water courses encountered in the work, shall be disposed of in a suitable manner without injury to adjacent property, the work under construction, or to pavements, roads, drives, and water courses. No water shall be discharged to sanitary sewers. Sanitary sewage shall be pumped to sanitary sewers or shall be disposed of by an approved method.
6. Any damage caused by or resulting from dewatering operations shall be the sole responsibility of the Contractor.

B. Work Included

1. The construction and removal of cofferdams, sheeting and bracing, and the furnishing of materials and labor necessary therefor.
2. The excavation and maintenance of ditches and sluiceways.
3. The furnishing and operation of pumps, well points, and appliances needed to maintain thorough drainage of the work in a satisfactory manner.

C. Well Point Systems

1. Installation
 - a. The well point system shall be designed and installed by or under the supervision of an organization whose principal business is well pointing and

which has at least five consecutive years of similar experience and can furnish a representative list of satisfactory similar operations.

- b. Well point headers, points and other pertinent equipment shall not be placed within the limits of the excavation in such a manner or location as to interfere with the laying of pipe or trenching operations or with the excavation and construction of other structures.
- c. Detached observation wells of similar construction to the well points shall be installed at intervals of not less than 50 feet along the opposite side of the excavation from the header pipe and line of well points, to a depth of at least 5 feet below the proposed excavation. In addition, one well point in every 50 feet shall be fitted with a tee, plug and valve so that the well point can be converted for use as an observation well. Observation wells shall be not less than 1-½ inches in diameter.
- d. Standby gasoline or diesel powered equipment shall be provided so that in the event of failure of the operating equipment, the standby equipment can be readily connected to the system. The standby equipment shall be maintained in good order and actuated regularly not less than twice a week.

2. Operation

- a. Where well points are used, the groundwater shall be lowered and maintained continuously (day and night) at a level not less than 2 feet below the bottom of the excavation. Excavation will not be permitted at a level lower than 2 feet above the water level as indicated by the observation wells.
- b. The effluent pumped from the well points shall be examined periodically by qualified personnel to determine if the system is operating satisfactorily without the removal of fines.
- c. The water level shall not be permitted to rise until construction in the immediate area is completed and the excavation backfilled.

3.03 BACKFILL AND FILL

A. General:

- 1. All material to be used as backfill material shall be tested and approved by the Geotechnical Engineer prior to backfilling excavations.
- 2. With the exception of the organic and inorganic debris, and topsoil, the on-site soil removed from the excavations could be used as non-structural fill or backfill material provided the moisture content of the soil is within acceptable limits. However, offsite borrow material may be required for use as non-structural fill. The use of off-site borrow material shall not result in additional compensation for the Contractor.
- 3. Place acceptable backfill material in maximum 6-8" lifts (loose thickness) to required subgrade elevations, for each area classification listed below.
 - a. In excavations, use satisfactory excavated or borrow material.
 - b. Under slabs, use drainage fill material for a minimum depth of 6-inches. Below drainage fill use satisfactory excavated or borrow material.

- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance of construction below finish grade.
 2. Inspection, testing, approval, and recording locations of underground utilities.
 3. Removal of concrete formwork.
 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
 5. Removal of trash and debris.
- C. Compaction:
1. Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.
 - a. Fill under slab-on-grade shall be compacted to 98% Standard Proctor Density, ASTM D698, at a moisture content between 2 percent below to 3 percent above the optimum moisture content.
 - b. Granular structural fill under foundation elements, i.e., footings and base slabs for tanks and basins shall be compacted to 98% Standard Proctor Density, ASTM D698, at a moisture content between 2 percent below to 3 percent above the optimum moisture content.
 2. Moisture Control
 - a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface or subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - b. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 - c. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing, or pulverizing until moisture content is reduced to the optimum moisture for compaction.
 3. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- D. Backfilling Trenches:
1. Backfilling shall be accomplished as soon as practical after pipe has been laid and jointing and alignment approved. Packing of crushed rock between joints shall be uniform and progress as the pipe laying progresses. This is in order to avoid danger

of misalignment from slides, flooding or other causes. The Engineer shall be given a maximum of 24 hours for inspection before backfilling.

2. The backfill over the pipe shall be in accordance with the details shown on the Drawings for bedding and backfilling pipe.
3. In case maximum permissible trench widths (as designated by the pipe manufacturer) are exceeded, the Contractor shall furnish crushed rock backfill to a minimum of 12-inches over the top of pipe at no extra cost to the Owner.
4. If additional earth is required for back filling, it must be obtained and placed by the Contractor.
5. In the case of street, highway, railroad, sidewalk and driveway crossings; or within any roadway paving; or about manholes, valve and meter boxes; the backfill must be mechanically tamped in not over 6 inch layers, measured loose. Alternate method of compacting backfill shall be used, if refill material is in large hard lumps (crushed rock excepted) which cannot be consolidated without leaving voids.
6. Where traffic on streets, driveways, railroads, sidewalks and highways requires temporary surfacing, backfilling shall be terminate 4-inches below original ground level and 4-inches to 6-inches of dense graded aggregate shall be placed on the trench. Backfill shall be maintained easily passable to traffic at original ground level, until acceptance of project or replacement of paving or sidewalks.
7. The Contractor shall protect all sewer, gas, electric, telephone, water, and drain pipes or conduits from damage while pipelines are being constructed and backfilled, and from danger due to settlement of trench backfill.
8. No extra payment shall be made for backfilling of any kind, except as specified hereinbefore. Backfilling shall be included as a part of the lump sum bid. No extra payment will be made to the Contractor for supplying outside materials for backfill.
9. On completion of the project, all backfill shall be dressed; holes filled; and surplus material hauled away. All permanent walks, street paving, roadway, etc., shall be restored and repaved to match existing pavement thickness over a width equal to the trench width plus 2 feet. A compacted subbase of 12" of KDOT DGA crushed stone with less than 5% passing the No. 200 sieve shall be added under concrete pavements (10" under asphalt concrete pavement).

3.04 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
- B. Grading Outside Building Lines:
 1. All materials used for backfill around structures shall be of a quality acceptable to the Engineer and shall be free from large or frozen lumps, wood and other extraneous material. All spaces excavated and not occupied by footings, foundations, walls or other permanent work shall be refilled with earth up to the surface of the surrounding ground, unless otherwise specified, with sufficient allowance for settlement. In making the fills and terraces around the structures, the

fill shall be placed in layers not exceeding 8-inches in depth and shall be kept smooth as the work progresses. Each layer of the fill shall be compacted. Sections of the fill immediately adjacent to buildings or structures shall be thoroughly compacted by means of mechanical tamping or hand tamping as may be required by the conditions encountered. All fills shall be placed so as to load structures symmetrically.

2. As set out hereinbefore, rough grading shall be held below finished grade and then the topsoil, which has been stockpiled, shall be evenly spread over the surface. The grading shall be brought to the levels shown on the Drawings. Final dressing shall be accomplished by hand work or machine work, or a combination of these methods as may be necessary to produce a uniform and smooth finish to all parts of the regrade. The surface shall be free from clods greater than 2-inches in diameter. Excavated rock may be placed in the fills, but it shall be thoroughly covered. Rock placed in fills shall not be closer than 12-inches from finished grade.
3. Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:
 - a. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not above or 1.0 inch below required subgrade elevation.
 - b. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1.0 in. below required subgrade elevation.
- C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1.0 in. above or 1.0 in. below required subgrade elevation when tested with a 10-ft. straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or standard proctor density for each area classification.
- E. Slope Protection and Erosion Control: Conform to the requirements of Section 02270 for permanent slope protection and erosion control.

3.05 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction:
 1. Allow the Geotechnical Engineer to inspect and report to the Engineer on findings and approve subgrades and fill layers before further construction work is performed.
 2. Perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2992 (nuclear density method), as applicable and at a frequency necessary to be reasonably assured that adequate compaction is achieved.
- B. If in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense to the Owner.

3.06 MAINTENANCE

- A. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- B. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.07 DISPOSAL OF EXCESS NON-ORGANIC SOIL AND ROCK

- A. General: All excess excavated material shall become the property of the Contractor and shall be disposed by him outside the project limits. It is the Contractor's responsibility to locate a suitable waste area off-site, obtain necessary permits or use of the waste area and be in compliance with applicable laws and regulations.

- END OF SECTION -

SECTION 312213
ROUGH GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Remove topsoil and stockpile for later reuse.
- B. Grade and rough contour site.

1.02 RELATED WORK

- A. Geotechnical investigation report is not available for this project.
- B. SECTION 312213 – ROUGH GRADING
- C. SECTION 312000 – EARTH MOVING.

1.03 PROJECT RECORD DOCUMENTS

- A. Submit document.
- B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 PROTECTION

- A. Protect trees and other features remaining as portion of final landscaping.
- B. Protect bench marks, existing structures, fences, roads, sidewalks and other features not designated for demolition.
- C. Protect above or below grade utilities which are to remain.
- D. Contractor shall be responsible for repairing any damage to those items not designated for demolition or removal in a manner satisfactory to the Owner at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Topsoil: Excavated material, graded free of roots, rocks larger than one inch, subsoil, debris, and large weeds.
- B. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.

PART 3 - EXECUTION**3.01 PREPARATION**

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.
- C. Identify and flag above grade utilities.
- D. Maintain and protect existing utilities remaining which pass through work area.
- E. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.

3.02 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, and stockpile in area designated on site by the Engineer.
- B. Do not excavate wet topsoil.
- C. Stockpile topsoil to depth not exceeding 8 feet.

3.03 SUBSOIL EXCAVATION

- A. Excavate subsoil from indicated areas and stockpile in area designated on site. Excess subsoil may be reused according to DIVISION 31.
- B. Do not excavate wet subsoil.
- C. Stockpile subsoil to depth not exceeding 8 feet.
- D. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.

3.04 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus three inches.

- END OF SECTION -

SECTION 312316**EXCAVATION****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. Structure excavation.
- B. Shoring excavations.

1.02 RELATED WORK

- A. Geotechnical Report in these specifications.
- B. SECTION 014500 - Quality Control.
- C. SECTION 312317 - Rock Removal.
- D. SECTION 312213 - Rough Grading.
- E. SECTION 312333 – Trenching & Backfilling.

1.03 REGULATORY REQUIREMENTS

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.
- B. # 57's or # 9's: Mineral aggregate graded 1/4 inch to 5/8 inch, free of soil, subsoil, clay, shale, or foreign matter.

PART 3 - EXECUTION**3.01 PREPARATION**

Identify required liens, levels, contours, and datum.

3.02 EXCAVATION

- A. Excavate subsoil required for structure foundations, construction operations, and other work. All excavation shall be unclassified excavation.
- B. Contractor is responsible to adequately brace open cuts and protect workmen and equipment from cave-in.
- C. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume. Remove larger material under Section 312317.
- D. Correct unauthorized excavation at no cost to Owner.
- E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Engineer.
- F. Stockpile excavated material in area designated on site.

3.03 FIELD QUALITY CONTROL

Provide for visual inspection of rock surfaces under provisions of Section 014500.

- END OF SECTION -

SECTION 312317**ROCK REMOVAL****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes removal to the widths and depths shown on the Contract Drawings or as directed by the Engineer, including the loosening, removing, transporting, storing and disposal of all materials requiring blasting, barring, or wedging for removal from their original beds, and backfill of rock excavations with acceptable materials
- B. Use of explosives for rock removal shall be used only with prior permission from both the Engineer and Owner. **Blasting will NOT be permitted in this project.**
- C. Rock removal is part of and incidental to unclassified excavation. No separate payment shall be made for rock removal.

1.02 SUBMITTALS

- A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:
 - 1. Before any blasting operations begin the Contractor shall obtain all permits and licenses required.

1.03 DEFINITIONS

- A. Rock
 - 1. All pieces of ledge or bedrock, boulders or masonry larger than one-half cubic yard in volume.
 - 2. Any material requiring blasting, barring, or wedging for removal from its original bed.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION**3.01 BLASTING (Use of explosives for rock removal shall be used only with prior permission from both the Engineer and Owner.)**

- A. General
 - 1. Handling of explosives and blasting shall be done only by experienced persons.

2. Handling and blasting shall be in accordance with all Federal, State and local laws, rules and regulations relating to the possession, handling, storage and transportation and use of explosives.
 3. All blasts in open cut shall be properly covered and protected with approved blasting mats.
 4. Charges shall be of such size that the excavation will not be unduly large and shall be so arranged and timed that adjacent rock, upon or against which pipelines or structures are to be built, will not be shattered.
 5. Blasting will not be permitted within 25 feet of pipelines or structures.
 6. All existing pipes or structures exposed during excavation shall be adequately protected from damage before proceeding with the blasting.
 7. NFPA 495 - Code for Manufacture, Transportation, Storage and Use of Explosive Materials.
 8. Commonwealth of Kentucky Department of Mines and Minerals, Laws and Regulations Governing Explosives and Blasting.
- B. Repair of Damages Due to Blasting
1. Any injury or damage to the work or to existing pipes or structures shall be repaired or rebuilt by the Contractor at his expense.
 2. Whenever blasting may damage adjacent rock, pipes or structures, blasting shall be discontinued and the rock removed by drilling, barring, wedging or other methods.
- C. Explosives
1. At no time shall an excessive amount of explosives be kept at the site of the work. Such explosives shall be stored, handled and used in conformity with all applicable laws and regulations.
 2. Accurate daily records shall be kept showing the amounts of explosives on hand, both at the site and at any storage magazine, the quantities received and issued, and the purpose for which issued.
 3. The Contractor shall be responsible for any damage or injury to any persons, property or structures as a result of his handling, storage or use of explosives.
- D. Rock Clearance in Trenches
1. Ledge rock, boulders and large stones shall be removed from the sides and bottom of the trench to provide clearance for the specified embedment of each pipe section, joint or appurtenance; but in no instance shall the clearance be less than 6 inches. Additional clearance at the pipe bell or joint shall be provided to allow for the proper make-up of the joint.
 2. At the transition from an earth bottom to a rock bottom the minimum bottom clearance shall be 12 inches for a distance of not less than 5 feet.
- E. Rock Clearance at Structures

1. Concrete for structures shall be placed directly on the rock and the excavation shall be only to the elevations and grades shown on the Contract Drawings.

3.02 EXCAVATION AND BACKFILL

- A. Rock removal and backfilling shall be performed in accordance with the applicable provisions of the Section entitled "Earthwork".
- B. The rock excavated which cannot be incorporated into the backfill material, as specified, shall be disposed of as spoil and shall be replaced with the quantity of acceptable material required for backfilling.

-END OF SECTION-

SECTION 312333**TRENCHING, BACKFILLING AND COMPACTING****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of the Section entitled "Earthwork" unless modified herein.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION**3.01 EXCAVATION**

- A. The trench excavation shall be located as shown on the Contract Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Contract Documents.
- B. Trenches shall be excavated to maintain the depths as shown on the Contract Drawings or as specified for the type of pipe to be installed.
- C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.
- D. The minimum width of trench excavation shall be 6-inches on each side of the pipe hub for 21-inch diameter pipe and smaller and 12-inches on each side of the pipe hub for 24-inch diameter pipe and larger.
- E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required.
- F. Bridging across open trenches shall be constructed and maintained where required.

3.02 SUBGRADE PREPARATION FOR PIPE

- A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.
- B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to

exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

- C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.
- D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.03 STORAGE OF MATERIALS

- A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits. Where no Highway Permit is required at least one-half of the street must be kept open for traffic.
- B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.
 - 1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.
- C. If directed by the Engineer, the Contractor shall refill trenches with select fill or other suitable materials and excess excavated materials shall be disposed of as spoil.

3.04 REMOVAL OF WATER AND DRAINAGE

- A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.
- B. The removal of water shall be in accordance with the Section entitled "Earthwork".

3.05 PIPE EMBEDMENT

- A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.
- B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated

unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

- C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

3.06 BACKFILL ABOVE EMBEDMENT

- A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.
 - 1. Where trenches are within the ditch-to-ditch limits of any street or road or within a driveway or sidewalk, or shall be under a structure, the trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted to obtain 95% maximum density, and determined as set forth in the Section entitled "Earthwork".
 - 2. Where trenches are in open fields or unimproved areas outside of the ditch limits of roads, the backfilling may be by placing the material in the trench and mounding the surface.
 - 3. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.
- B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.
 - 1. Where trenches cross waterways, the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete rip-rap or pavement.
- C. All settlement of the backfill shall be refilled and compacted as it occurs.

-END OF SECTION-

SECTION 312500

SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall do all work and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area so as to prevent damage to adjacent property.
- B. The Contractor shall not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction. The Contractor shall be responsible for obtaining all associated permits.
- C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Temporary Slope Protection and Erosion Control:

Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials. Filter fabric for sediment traps shall be of suitable materials acceptable to the Engineer.
- B. Permanent Slope Protection and Erosion Control:

On slopes 2H:1V and steeper, and where shown on the drawings place Type A Dumped Rock Fill with a 24-inch minimum thickness over non-woven geotextile filter fabric.

PART 3 - EXECUTION

3.01 METHODS OF CONSTRUCTION

- A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches and settling basins.
- B. Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment

basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

- C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer.
- D. For work within easements, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of the easements.
- E. The Contractor shall not pump silt-laden water from trenches or other excavations into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- F. Prohibited construction procedures include, but are not limited to, the following:
 - 1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
 - 2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.
 - 3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.
 - 4. Damaging vegetation adjacent to or outside of the construction area limits.
 - 5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
 - 6. Permanent or unauthorized alteration of the flow line of any stream.
 - 7. Open burning of debris from the construction work.
- G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

3.02 EROSION CHECKS

The Contractor shall furnish and install baled hay or straw erosion checks in all locations indicated on the Drawings, surrounding the base of all deposits of stored excavated material outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Drawings, shall be installed immediately after the site is cleared and before trench excavation is begun at the location indicated. Checks located surrounding stored material shall be located approximately 6 ft. from that material. Bales shall be held in place with two 2 in. by 2 in. by 3 ft. wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short circuiting of the erosion check.

DIVISION 32
EXTERIOR IMPROVEMENTS

SECTION 321216
ASPHALT PAVING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The hot-mix asphalt paving work includes the construction of an aggregate base course, asphalt base and wearing courses as specified herein. This work is to replace paving disturbed by the construction and any damages to paving by Contractor's operations, as well as new pavement and driveways, within the limits shown on the plans.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. The general provisions of the Contract, including General Conditions and General Requirements apply to the work specified in this section.
- B. Earthwork: Section 31 20 00

1.03 APPLICABLE STANDARDS

- A. All references in this section to the Standard Specifications shall refer to the most recent Edition of Standard Specifications for Road and Bridge Construction with all amendments thereto as published by the Kentucky Transportation Cabinet (KYTC).

1.04 SUBMITTALS

- A. Job-Mix Designs: For each job mix proposed for the Work.
- B. Comply with the requirements of Section 013323.

1.05 QUALITY ASSURANCE

- A. Hot Mix Asphalt Producer Qualifications: Engage a firm experienced in producing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
- B. Producer firms shall be qualified through the Kentucky Transportation Cabinet as an approved Asphalt Mix Producing Firm.
- C. Testing and inspection: The Contractor shall retain a qualified testing laboratory for testing and inspection.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp. Comply with the provisions of KYTC Standard Specifications for temperature requirements.
- B. Grade Control: Establish and maintain required lines and elevations.

PART 2 – PRODUCTS

2.01 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Aggregate Base Course: Dense Graded Aggregate Base (DGA) complying with Section 302 and 805 of the Standard Specifications.
- C. Coarse Aggregate: Sound, angular crushed stone, or crushed gravel, complying with Standard Specifications Section 805.

2.02 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO MP 1, Performance Graded Binder PG 64-22 for general applications.
- B. Tack Coat: Comply with provisions in KYTC Standard Specifications Section 406.

2.03 MIXES

- A. Hot-Mix Asphalt: Hot-laid, hot-mix asphalt plant mixes meeting the requirements of the Standard Specifications of the Kentucky Transportation Cabinet (KYTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements:
 - 1. Base Course: Produce KYTC mixture designation Class 2 Base. There shall be no restrictions on polish resistant aggregates (utilize KYTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with Standard Specifications Section 409.
 - 2. Surface Course: KYTC mixture designation Class 2 Surface. The mixture gradation may pass through the restricted zone and there shall be no restriction on polish resistant aggregates (utilize KYTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with Standard Specifications Section 409.
- B. Hot-Mix Asphalt: Hot-laid, hot-mix asphalt plant mixes designed according to procedures established by the Kentucky Transportation Cabinet (KYTC) and complying with the following requirements.
 - 1. Provide mixes complying with composition, grading, and tolerance requirements Standard Specifications for the following nominal, maximum aggregate sizes:
 - a. Base Course: Mixture with a nominal maximum aggregate size of 0.75 inch with a minimum Voids in the Mineral Aggregate (VMA) of 12 percent.
 - b. Surface Course: Mixture with a nominal maximum aggregate size of 0.38 inch with a minimum VMA of 14 percent.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Pavement installer must examine the areas excavated and backfilled and conditions under which pavement is to be constructed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory embankments and subgrade have been established to a uniform line, properly shaped and compacted.
- B. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- C. Proof-roll subbase using loaded dump trucks or heavy rubber-tired construction equipment to locate areas that are unstable or that require further compaction.
- D. Proceed with paving only after unsatisfactory conditions have been corrected.
- E. Repairs to Base Course: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
- F. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.02 AGGREGATE BASE COURSES

- A. Place aggregate base course on subgrades free of mud, frost, snow, or ice in accordance with Section 302 of the Standard Specifications.
- B. On prepared subgrade, place base course as follows:
 - 1. Shape base course to required crown elevations and cross-slope grades.
 - 2. Place base course that exceeds 9 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D698 or in accordance with Section 302.03.04 of the Standard Specifications.

3.03 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Tack Coat: Comply with provisions in Standard Specifications Section 406. Apply to the surface of concrete surfaces, existing asphalt surfaces and, when necessary, to newly constructed asphalt surfaces.

3.04 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Comply with applicable provisions of KYTC Standard Specifications Section 403 for delivery, placement, spreading and compaction of the mixture.
1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent.

3.05 FIELD QUALITY CONTROL

- A. Thickness Tolerances: Compact each course to produce the thickness indicated within the following tolerances:
1. Aggregate and asphalt base Course: Plus or minus 1/2 inch.
 2. Asphalt surface course: Plus or minus 1/4 inch.
 3. Provide a minimum fall of 2% to facilitate drainage unless otherwise indicated on the Drawings.
- B. Surface Smoothness: Compact each course to produce a surface smoothness with the following tolerances as determined using a 10-foot straightedge applied transversely or longitudinally to paved areas:
1. Aggregate base course: 3/8 inch.
 2. Asphalt base course: 1/4 inch.
 3. Asphalt surface course: 1/8 inch.
 4. Crowned surfaces: Test with crowned template centered and at a right angle to crown. Maximum allowable variance from template is 1/4 inch.
- C. In-Place Density: Filed density test of in-place compacted aggregate base will be determined by nuclear method in accordance with ASTM D 2940. Field density of in-place compacted pavement will be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726. Test will be made for every 1,000 square yards or less of installed pavement.
- D. Core Sampling: If required to confirm either thickness tolerances or compaction of asphalt courses, core samples shall be taken and tested according to ASTM D 3549 for thickness and ASTM D 1188 or ASTM D 2726 for compaction. Determination of need for core samples will be made by the Engineer.

- END OF SECTION -

SECTION 321540
CRUSHED STONE SURFACING

PART 1 - GENERAL**1.01 SCOPE OF WORK**

- A. Furnish and install crushed stone for miscellaneous uses as shown on the Drawings, as called for in the Specifications.
- B. Sizes, types, and quality of crushed stone are specified in this Section, but its use for replacement of unsuitable material, pavement base, and similar uses is specified in detail elsewhere in the Specifications. The Engineer may order the use of crushed stone for purposes other than those specified in other Sections, if, in his opinion, such use is advisable. Payment for same will be subject to negotiation.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. When referred to in these Specifications, crushed stone shall be Number 57 graded in accordance with the Kentucky Department of Highways, Standard Specifications, latest edition, unless otherwise noted.
- B. When referred to in these Specifications, dense graded aggregate (DGA) shall be crushed stone classified by the Kentucky Department of Highways, Standard Specifications, latest edition, and conforming to the following requirements:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 Inch	100
3/4 Inch	70 - 100
1/2 Inch	50 - 80
#4	30 - 65
#10	17 - 50
#40	8 - 30
#200	2 - 10

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. Crushed stone shall be placed and compacted in accordance with the Kentucky Department of Highways, Standard Specifications.
- B. Crushed stone shall be placed in those areas as shown on the Drawings.

-- END OF SECTION --

SECTION 329200**TURF & GRASSES****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Provide all labor, materials, equipment, and services required for seeding of all disturbed areas caused by construction activities and for installation of sod where indicated on the Contract Drawings or specified herein.

1.02 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to Work of this Section.
- B. SECTION 312000 – EARTH MOVING

1.03 MAINTENANCE

- A. Maintenance shall begin immediately following the last operation of installation for each portion of lawn.
- B. Lawns shall be maintained by watering, mowing, and for resodding for a period of forty-five (45) days. At the end of this period an inspection will be made and any deficiencies, which may be attributable to the Contractor, will be noted in writing. At this time, the Owner will assume the maintenance. Another inspection will be made at the beginning of the next planting season, and any of the previously noted deficiencies still existing shall be repaired by the Contractor.

1.04 INSPECTION FOR ACCEPTANCE

- A. The Inspection of the Work:
 - 1. The inspection of the work of lawns to determine the completion of contract work exclusive of the possible replacement of plants, will be made by the Architect/Engineer upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to the anticipated date.
- B. Acceptance:
 - 1. After inspection, the Contractor will be notified in writing by the Owner of acceptance of all work of this Section, exclusive of the possible replacement of plants subject to guaranty, or if there are any deficiencies of the requirements of completion of the Work.

PART 2 - PRODUCTS**2.01 WATER**

- A. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life.

- B. Hose and other watering equipment required for the Work shall be furnished by the Contractor.

2.02 TOPSOIL

- A. The Contractor shall furnish and place sufficient topsoil for the seeding and installation of sod.

2.03 FERTILIZER

- A. Commercial fertilizer for lawn areas shall be complete fertilizer, formula 10-10-10, for lawns and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guarantee analysis. Any fertilizer which becomes caked or otherwise damaged making it unsuitable for use will not be accepted.
- B. Fertilizer shall be applied at the rate of 25 pounds per 1,000 square feet.

2.04 GRASS SEED

- A. The seed mixture to be sown shall be in the following proportions:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>% of Purity</u>	<u>% of Germination</u>
Fine Lawn Fescue	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	5	95	90

- B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.
- C. Germination must be certified to conform to the following minimums:

Purity	90%
Germination	85%

2.05 SOD

- A. Sod shall be at least 70% Bluegrass, strongly rooted and free of pernicious weeds.
- B. It shall be mowed to a height not to exceed 3" before lifting, and shall be of uniform thickness with not over 1-1/2" or less than 1" of soil.

2.06 MULCH

- A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.

- B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2 inch loose depth).
- C. Mulch on slopes greater than 1: 3 shall be held in place with erosion control netting.
- D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with erosion control netting.

PART 3 - EXECUTION

3.01 TIME OF PLANTING

- A. Planting operations shall be conducted under favorable weather conditions during seasons which are normal for such work as determined by accepted practice in the locality of the project. At the option and on full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

3.02 LAWNS

- A. Areas to be sodded are designated on the Drawings. All other lawn areas, including areas of cut and fill and where existing ground has been disturbed by construction operations shall be seeded.
- B. Fertilizer:
 - 1. Fertilizer shall be applied at the rate of 25 pounds per 1,000 square feet to the lawn area being prepared for planting and mixed lightly into the top few inches of topsoil. Fertilizer may be mixed with and distributed with grass seed.
- C. Planting of Lawns:
 - 1. Sowing of Seed:
 - a. Immediately before any seed is to be sown, the ground shall be scarified as necessary, and shall be raked until the surface is smooth, friable and of uniformly fine texture. Lawn areas shall be seeded evenly with a mechanical spreader at the rate of 4 pounds per 1,000 square feet of area, lightly raked, rolled with a 200-pound roller and watered with a fine spray. The method of seeding may be varied at the discretion of the Contractor on his own responsibility to establish a smooth, uniform turf composed of the grasses specified. The sowing of seed shall be done only within the season extending from March 1st to May 15th and from September 1st to October 15th, unless other seasons may be approved by the Owner.
 - 2. Laying of Sod:
 - a. Before any sod is laid, all soft spots and inequalities in grade shall be corrected. Fertilizer spread shall be raked in. Sod shall be laid so that no voids occur, tamped or rolled and then thoroughly watered. The complete sodded surface shall be true to finished grade, even and firm at all points. Sodding shall be done only within the seasons extending from

March 1st to May 15th and from September 1st to October 15th, unless other seasons may be approved by the Owner.

3. Sod on Slopes:
 - a. Sod on slopes 2 to 1 or steeper shall be held in place by wooden pins about 1-inch square and about 6 inches long driven through the sod into the soil until they are flush with the top of the sod, or by other approved methods for holding the sod in place.
4. Mulching:
 - a. All seeded areas are to be mulched with Conwed Hydro Mulch, Silva-Fiber, or equal, or with clean straw as specified under PRODUCTS. Mulch shall be applied at the rate of 1,500 pounds per acre. It may be applied with hydraulic equipment or may be added to the water slurry in a hydraulic seeder and the seeding and mulching combined in one operation. Clean straw may be spread by hand to cover the seeded areas at a depth of two (2) inches. Erosion control netting shall be installed and anchored per manufacturer's instructions in areas of slopes, ditches, or surface water runoff.

3.03 CLEAN UP

- A. All soil, peat or similar material which has been brought over paved areas by hauling operations or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of the planting all excess soil, stone and debris which have not previously been cleaned up shall be removed from the site or disposed of as directed by the Owner. All lawns shall be prepared for final inspection.

3.04 OTHER WORK

- A. The Contractor also shall be responsible for the repair of any damage caused by his activities or those of his subcontractors, such as the storage of topsoil or other materials, operations or equipment, or other usages to all on-site areas outside the contract limits. Such repair operations shall include any regrading, seeding or other work necessary to restore such areas to an acceptable condition.

3.05 QUALITY CONTROL

- A. Areas seeded shall be protected until a uniform stand develops, when it will be accepted and the Contractor relieved of further responsibility for maintenance. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall refertilize, reseed and remulch as needed. Scattered bare spots up to one (1) square yard in size will be allowed up to a maximum of 10 percent of any area.

- END OF SECTION -

DIVISION 33

UTILITIES

SECTION 330507
BORING AND JACKING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to furnish and install all bored and jacked carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 312000 – EARTH MOVING
- B. SECTION 312213 – ROUGH GRADING
- C. SECTION 331413 – WATER DISTRIBUTION PIPING

1.03 SUBMITTALS

- A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.
- B. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.
- C. Comply with all requirements of DIVISION 01.

1.04 EXISTING CONDITIONS

- A. The existing piping and other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.
- B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically & horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.
- C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

PART 2 - PRODUCTS

2.01 CARRIER PIPE

- A. Carrier pipe shall be as specified in the applicable Division 33 section unless otherwise noted.

2.02 CASING PIPE

- A. Casing pipe shall be steel, plain end, have a minimum yield point strength of 35,000 psi and conform to ASTM A 252 Grade 2 or ASTM A 139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least 18 foot lengths.
- B. The diameter of the casing pipe shall be as follows:

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

For carrier pipe sizes greater than 36-inches nominal diameter, the casing pipe diameter size shall be determined by the Engineer or as shown on the Contract Drawings.

- C. The wall thickness of the casing pipe shall be as follows:

Casing Pipe Nominal Diameter (Inches)								
Under 20	20 & 22	24	30	36	38	42	48	50
Casing Pipe Nominal Thickness (Inches)								
.375"	.375"	.375"	.406"	.469"	.500"	.562"	.625"	.656"

However, should casing pipe thickness be specified or required on Highway or Railroad permit approval sheets, said permit thickness requirement shall govern. Permit approval sheets will be made available to the Contractor.

2.3 CASING SPACERS

- A. **Stainless Steel Casing Spacers:** Stainless steel casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090" thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co., or equal.
- B. **Solid Polyethylene Casing Spacers (to be used with PVC pipe only):** Solid polyethylene casing spacers shall be bolt-on style with a shell made in two (2) sections. Carrier pipe shall be wrapped with rubber strap inside casing space to prevent slippage. All nuts and bolts are to be 18-8 stainless steel. Solid polyethylene casing spacers shall be made by Calpico Inc., Advance Products & Systems, Inc., or equal.

2.04 CASING END SEALS

- A. Wrap-around end seals - Wrap-around end seals shall be made of a waterproof flexible coal tar membrane reinforced with fiberglass, or synthetic rubber. The two exposed edges of the wrap-around seal shall be adhesively bonded forming a watertight seal. The ends of the wrap shall be sealed on the casing and carrier pipe by stainless steel bands. Wrap-around end seals shall be made by Calpico Inc., Advance Products & Systems, Inc., or equal.
- B. Upon approval the by Engineer, in lieu of wrap-around end seals, each end of the casing pipe and the carrier pipe shall be wrapped with two (2) layers of roofing felt.

PART 3 - EXECUTION

3.01 CROSSINGS - GENERAL

- A. Where designated on the drawings, crossings beneath state maintained roads, not to be disturbed shall be accomplished by boring and jacking a casing pipe.
- B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place, and shall extend a minimum of two (2) feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe within the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75" from the casing pipe wall at all times. Manufacturer's recommendations may govern these requirements.
- C. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.
- D. Wood skids are not an acceptable method of supporting the carrier pipe.

3.02 BORING AND JACKING

- A. The Contractor shall excavate his own pits, as he may deem necessary, and will set his own line and grade stakes which shall be checked by the Engineer. Permits, as required, will be furnished or obtained by the Owner, but shall be in the Contractor's hands before any excavating is commenced.
- B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.
 - 1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.

2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, the pipe shall be abandoned in place and immediately filled with grout.
 3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 2 inch. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, grouting or other approved methods must be used to fill such voids.
 4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
 5. Any method which does not have this boring arrangement will not be permitted. Contractor's boring arrangement plans and methods must be submitted to, and approved by, the Engineer.
- C. In the event an obstruction is encountered in boring which cannot be removed and it becomes necessary to withdraw the casing and commence elsewhere, the hole from which the casing is withdrawn shall be completely backfilled with coarse sand rammed in.
- D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.
- E. Before award of the contract, the Contractor shall furnish a statement of his experience of such work, or if inexperienced, shall advise the Owner as to whom he will sublet the work and give a statement of the experience of the subcontractor, which shall be satisfactory to the Owner.

3.03 CONTRACTOR'S RESPONSIBILITIES

- A. Obtain a copy of the Highway Encroachment and/or Railroad Permit before beginning construction.
- B. Attend a preconstruction meeting at the construction site with the City Inspector, Railroad Inspector, Highway Inspector Engineer, and Contractor being present.

- END OF SECTION -

SECTION 331413
WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 331419 – VALVES & HYDRANTS

1.03 SUBMITTALS

- A. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.
- B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with DIVISION 01.

1.04 EXISTING CONDITIONS

- A. The existing piping shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping.
- B. So that piping conflicts may be avoided, Contractor shall open up his trench well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.
- C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

1.05 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

- A. All activities involving utility line construction covered under the US Army Corps of Engineers NATIONWIDE PERMIT # 12 shall meet the following conditions:
 - 1. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity.
 - 2. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures,

work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

3. Notification: The permittee must submit a pre-construction notification to the US Army Corps district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials.

- B. All activities involving utility line construction covered under KENTUCKY GENERAL CERTIFICATION of Nationwide Permit # 12 shall meet the following conditions:

The general Water Quality Certification applies to surface waters of the Commonwealth as defined in 401KAR10:001 Chapter 10, Section 1(80): Surface waters means those waters having well-defined banks and beds, either constantly or intermittently flowing, lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface.

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.
3. This general water quality certification does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.
4. For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed 1/2 acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.
6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.

7. Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.
12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.
13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
 - a. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
 - b. Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.

- c. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
- d. Removal of riparian vegetation shall be limited to that necessary for equipment access.
- e. To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
- f. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
- g. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- h. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
- i. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

- 16. Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

1.06 CONSTRUCTION IN A FLOODPLAIN

- A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.
- B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.01 POLYVINYL CHLORIDE PLASTIC (PVC) PIPE

- A. AWWA C-900
 - 1. 4-inch through 12-inch - PVC plastic pipe shall conform to ANSI/AWWA C-900, DR 18 pressure class 235. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform with the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe
- B. CLASS 200 & 250
 - 1. Polyvinyl chloride (PVC) pipe for water mains shall be Class 200 (SDR 21) or Class 250 (SDR 17) PVC pressure rated pipe as shown on the Drawings or indicated in

the proposal form with either twin gasket joints or integral bell joints with rubber O-ring seals.

2. All PVC pipe shall conform to the latest revisions of ASTM D-1784 (PVC Compounds), ASTM D-2241 (PVC Plastic Pipe, SDR) and ASTM D-2672 (Bell-End PVC Pipe). Rubber gasketed joints shall conform to ASTM D-3139. The gaskets for the PVC pipe joint shall conform to ASTM F-477 and D-1869.
 3. Couplings shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are used. Rubber gasket joints shall provide adequate expansion to allow for a 50 degree change in temperature on one length of pipe. Lubrication for rubber connected couplings shall be water soluble, non-toxic, be non-objectionable in taste and odor and have no deteriorating affect on the PVC or rubber gaskets and shall be as supplied by the pipe manufacturer. Couplings shall conform to ASTM D-3139; SDR-21, 200 psi.
 4. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them. Pipe and coupling markings shall include the normal size and OD base, material code designation, dimension ratio number, ASTM Pressure Class, ASTM designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.
- C. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision, and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.
- D. The basis of acceptance of PVC plastic water main pipe will be a written, notarized certification, accompanied by a copy of test results, that the pipe and pipe material has been sampled, tested and inspected in accordance with the designated standard specifications. These certifications shall be obtained from the manufacturer and delivered to the Engineer's or Owner's representative on the project site. A sufficient number of tests and certifications shall be made so as to be representative of the complete project. Copies of the test results shall be kept on file by the manufacturer and shall be available for review by the Engineer or Owner upon request.
- E. Pipe shall be visually inspected on the project site for proper markings which shall include manufacturer's name or trademark, nominal pipe size, pressure rating for water at 73.4 degrees F., plastic pipe material designation code (e.g. PVC 1120), dimension ratio, AWWA or ASTM designation and pressure class with which the pipe complies, and the National Sanitation Foundation NSF 14 Seal of Approval for drinking water.

2.02 DUCTILE IRON PIPE (D.I.P.)

- A. AWWA C150/AWWA C151
1. Ductile iron pipe (D.I.P.) shall conform to ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 Standard. The pipe shall conform to thickness class 350 unless noted otherwise. All pipe, fittings and joints should be capable of accommodating pressure up to 350 psi. Joint restraints required. SEE SECTION 012500 PRODUCTS & SUBSTITUTIONS.

2. All pipe shall be tar coated outside and shall receive a standard cement lining with bituminous seal coat on the inside in accordance with ASA Specification A21.40 (AWWA-C104).
3. Cement mortar lining and seal coating for pipe where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
4. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.
5. Push-on type joints shall be single rubber gasket, with cast gasket socket and recessed bell with a tapered annular opening and flared socket and shall conform to ANSI/AWWA C111/A21.11. Plain spigot ends shall be suitably beveled to permit easy entry into the bell, centering and compressing the gasket.
6. Ductile iron flanged joint pipe shall conform to ANSI/AWWA C115/A 21.15 Standard and have a Class of 350. The pipe shall have a rated working pressure of 350 psi with Class 125 flanges. Gaskets shall be ring gaskets with a thickness of 1/8-inch. Flange bolts shall conform to ANSI B16.1.
7. Flanged fittings shall meet all requirements of ANSI/AWWA C110/A21.10 and have Class 125 flanges. Fittings shall accommodate a working pressure up to 350 psi and be supplied with all accessories.
8. River crossing pipe shall be ductile iron with ball and socket type joint. The joint shall be boltless with restraint provided by a bayonet-type locking of the retainer over the bell. All pipe components shall be rugged, high strength ductile iron. The barrel is cast of 60-42-10 ductile iron in accordance with American National Standard A21.51. The bell, ball, and retainer are cast of 70-50-05 ductile iron in accordance with the applicable requirements of American National Standard A21.10. The gasket will be of high quality rubber and symmetrical in shape. The first and last section of river crossing pipe shall be furnished with mechanical joint ends suitable for connection to the remaining system piping.
9. Restraint glands or fittings shall be either "Meg-a-Lug" or "Series 100" or "Series 1200" as manufactured by EBBA Iron Sales, Inc., Eastland, Texas.
10. Restrained Joint Pipe:
 - a. Restrained joints for 4" through 16" push-on joint pipe installation is required and indicated in the project plans or specifications, restrained push-on joint pipe and fittings utilizing ductile iron components shall be provided.
 - b. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11. Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50, and shall be based on laying conditions and internal

pressures as stated in the project plans and specifications. Pipe shall be U.S. Pipe TR FLEX pipe or equal.

- c. Restrained joint fittings shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11. Fittings shall be U.S. Pipe TR FLEX fittings or equal.
- d. Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
- e. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi in sizes 4" through 24" and 250 psi for sizes 30" through 54".
- f. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.

2.03 HIGH-DENSITY POLYETHYLENE AWWA C906

A. AWWA C906

- 1. General: This section is for High-density Polyethylene AWWA C906 and NSF 14 Approved Pipe for Potable Water Service in Sizes 4" to 24" DIPS (Ductile Iron Pipe Size) and defines the characteristics and properties of high-density polyethylene pipe. This specification governs the material, pipe, fittings, butt fusion, and general construction practice for HDPE piping systems.
 - a. Pipe shall have a hydrostatic design stress rating of 800 psi based on a material with a 1,600 psi at 23° hydrostatic design basis as determined in accordance with ASTM D-2837.
 - b. Fittings shall be molded or fabricated from material meeting the same standards as the pipe.
 - c. Joints shall be made by the thermal butt fusion system. All joints shall be completely watertight, airtight and as strong as or stronger than the pipe wall, in strict accordance with the manufacturer's recommendations.
 - d. Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400°F, alignment, and 150 psi interfacial fusion pressure.
 - e. Heat fusion joining shall be 100% efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used.

2. References: Where all or part of a Federal, ASTM, ANSI, AWWA, etc., standard specification is incorporated by reference in these Specifications, the reference standard shall be the latest edition and revision and considered a part of these specifications.
3. Material: Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density PE 3408 polyethylene resin. The material shall be listed by PPI (Plastics Pipe Institute, a division of the Society of the Plastics Industry) in PPI TR-4 with a 73°F hydrostatic design basis of 1,600 psi and a 140°F hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D 2837 testing.
4. Pipe and Fittings: Qualification of Manufacturers. The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Owner or his Authorized Representative.
 - a. Pipe: Pipe supplied under this specification shall have a nominal DIPS (Ductile Iron Pipe Size) OD unless otherwise specified. The DR (Dimension Ratio) and the pressure rating of the pipe supplied shall be as shown on the drawings. The pipe shall be produced from approved HDPE pipe grade resin with the nominal physical properties as specified in the appropriate ASTM specifications for the sizes indicated. Pipe having a diameter 3" and larger will be made to the dimensions and tolerances specified in ASTM F 714.

The pipe shall contain no recycled compound except that generated in the manufacturer's own plant. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

- b. Pipe Performance: The pipe will be extruded from resin meeting the specifications of ASTM D 3350 with a minimum cell classification of 345464C.
- c. Fittings: HDPE fittings shall be in accordance with ASTM D 3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor. The fittings shall be manufactured from the same base resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.
- d. Molded Fittings. Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.
- e. X-Ray Inspection. The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection.
- f. Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure

service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.

- g. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient throughbore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.
5. Joining - Butt Fusion: Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer. Properly executed electrofusion fittings may be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications or fabrications where shear or structural strength is important. Mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be used to mechanically connect HDPE pipe. Refer to the manufacturer's recommendations.
 6. Joining - Other Means: Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.
 - a. ID Stiffener and Restraint. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.
 7. Quality and Workmanship: The pipe and/or fitting manufacturer's production facilities shall be open for inspection by the owner or his designated agents with a reasonable advanced notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to standards required by this specification. Pipe which has been tested by the manufacturer and falls outside of the appropriate limits set forth in this specification will be cause for rejection.
 8. QA Records: QA/QC records shall be maintained intact for a minimum of one year from the date of production.
 9. Pipe Marking: During extrusion production, the HDPE pipe shall be continuously marked with durable printing including the following information:
 - Nominal Size
 - Dimension Ratio
 - Pressure Class, psi
 - Manufacturer's Name and Product Series
 - Cell Class
 - ASTM Basis

“NSF-PW”
 Pipe Test Category
 Plant Code & Extruder
 Production Date
 Operator Number (Shift Letter optional)
 Resin Supplier Code

10. Pipe Packaging, Handling, & Storage: The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer’s recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method. Fused segments of pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.
11. Testing:
- a. Fusion Quality. The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor’s fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.
 - b. Hydro-Test: Pipelines shall be tested to the requirements and specifications of the engineer of record. HDPE pressure pipe shall be tested in accordance with the specifications and requirements of the engineer of record and/or with the manufacturer’s recommendations. The pressure rating of the pipe is a function of temperature at the time of hydro-test. Refer to the manufacturer’s temperature related pressure ratings. At a minimum and if not specified elsewhere, hydro-test the piping system at 1.5 times the pressure rating of the pipe for 2 to 3 hours per Driscopipe Technical Note #35. If a system component such as a fabricated or mechanical fitting has a pressure rating less than that of the pipe, the piping system should be pressure tested to manufacturer’s guidelines on that component.

2.04 COUPLING AND ADAPTORS

- A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the

follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

- B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.
- C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:
- D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe.

<u>Dresser</u>	<u>Rockwell</u>
Style 138	411

- E. Transition couplings for joining pipe of different outside diameters-

<u>Dresser</u>	<u>Rockwell</u>
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

- F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

<u>Dresser</u>	<u>Rockwell</u>
Style 127 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" C.I. Pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

2.05 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

- A. Detectable underground utility warning tapes which can be located from the surface by a pipe detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.
- B. The tape shall consist of a minimum thickness 0.35 mils solid aluminum foil encased in a protective inert plastic jacket that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil.
- C. The minimum overall thickness of the tape shall be 5.5 mils and the width shall not be less than 2" with a minimum unit weight of 2-1/2 pounds/1" x 1,000'. The tape shall be color coded and imprinted with the legend as follows:

<u>Type of Utility</u>	<u>Color Code</u>	<u>Legend</u>
Water	Blue	Caution Buried Water Line Below

- D. Detectable underground tape shall be "Detect Tape" as manufactured by Allen Systems, or equal.
- E. Installation of detectable tapes shall be per manufacturer's recommendations and shall be as close to the grade as is practical for optimum protection and detectability. Allow a minimum of 18" between the tape and the line.
- F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.06 TRACER WIRE

- A. Tracer wire shall be 12 gauge copper wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried piping, "duct" taped to top of pipe.
- B. Split Bolt connectors are required when connecting two (2) pieces of tracer wire. Wire and connector shall be wrapped with electrical tape.
- C. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point for tracer wire. Locator boxes shall be installed at a maximum of 3000 linear feet apart, or where shown on the Drawings.
- D. Payment for tracer wire and boxes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.07 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

- A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.
- B. Concrete shall be 3,500 psi, and reinforcing bars shall be installed as indicated on the details.

2.08 CONNECTION OF NEW WATER MAINS TO EXISTING SYSTEM

- A. The Contractor shall connect the new water main to existing water main where shown on the Drawings or directed by the Engineer, and shall furnish all necessary equipment and materials required to complete the connection.

2.09 POLYETHYLENE (PE) TUBING

- A. Customer service tubing, sizes 3/4-inch and 1-inch, shall be Polyethylene (PE) DR-9 (200 psi) and conform to AWWA C901, ASTM F 741 with a pipe designation of PE 3408 defined per ASTM D 3035 for IPS sizes and ASTM D 2737 for CTS sizes.

2.10 CUSTOMER SERVICE RELOCATIONS AND RE-CONNECTIONS

Where water service lines are disturbed, the Contractor shall reconnect the existing service line to the new water main. The Contractor shall furnish and install the necessary piping, couplings, fittings, etc. necessary to complete the service line re-connection.

- A. Service Lines Not Crossing a Road
 - 1. Unless indicated otherwise on the plans, all service lines shall be of PE tubing.
 - 2. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer and as shown on the Drawings.
- B. Service Lines Crossing a County Road or City Streets
 - 1. Same as subparagraph A, except that in general all pipe may be jacked beneath certain paved or blacktopped city streets or county roads, unless solid rock prevents using this method in which case, the open trench method will be used. Schedule 40 steel pipe shall be used as casing pipe unless otherwise indicated by the plans. The open trench method generally will be used on all unpaved city streets, county roads and private driveways. In general, blacktopped private driveways shall also be jacked under. In all cases where lines are under traffic, a minimum cover of thirty-six (36) inches shall be provided. All backfill shall be compacted by air tampers in layers no greater than 6-inch depth. Specific instructions as to the type of crossing to be installed will be shown on the plans.
- C. Service Lines Crossing a State Highway
 - 1. Services shall be jacked or pushed under paving. If solid rock is encountered, trench will be open-cut, pipe placed and backfilled all in accordance with current requirements of the State Highway Department or the crossing will be relocated to permit boring or jacking. Specific details will be shown on the plans. Where required on the plans or by the ENGINEER service pipe shall be encased under highways. Schedule 40 steel pipe shall be used as casing pipe unless otherwise indicated by the plans.
- D. Existing Galvanized Iron Services
 - 1. All galvanized services are to be replaced in their entirety, including service piping from the main to the meter, corporation stops, water meters, meter setters, meter boxes, and service piping five (5) feet past the meter. Service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein.

2.11 CORPORATION STOPS AND FITTINGS FOR HOUSE SERVICE RECONNECTIONS

- A. Corporation stops, of the size required, shall be tapped directly into the water main for Ductile Iron Pipe or by the use of a tapping saddle for PVC pipe.
- B. Corporation stops shall have AWWA C800-66 C.S. threaded inlet. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.
- C. Corporation stops shall match the listed manufacturer listed in SECTION 012500 – PRODUCTS & SUBSTITUTIONS or Owner and Engineer approved equal.
- D. Fittings shall be brass.

PART 3 - EXECUTION

3.01 EXCAVATION FOR PIPELINE TRENCHES

- A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.
- B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.
- C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.
- D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

- E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.
- G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.
- H. Minimum cover of 36" shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42".

3.02 PIPE BEDDING

- A. All pipe shall be supported on a bed of granular material, unless the trench has been prepared in accordance with Paragraph 3.1B. In no case shall pipe be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel.
- B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.
- C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.
- D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.
- E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.
- F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.03 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.2E, granular material for "Special Granular Fill" when directed by the Engineer shall be Department of Transportation crushed limestone, Size #57. Payment for "Special Granular Fill" must have approval from the Engineer prior to installation.

3.04 LAYING PIPE

- A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to ensure that it is clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.
- E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.
- F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.
- G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.05 BACKFILLING PIPELINE TRENCHES

- A. Backfilling of pipeline trenches shall be accomplished as shown on the Drawings and with details set forth hereinafter. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction. In the event that pavement is not placed immediately following trench backfilling in paved areas, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. Under pavement, all trench backfill shall be in accordance with Method C as shown on the Detail Drawings. All other trench backfill shall be in accordance with Method A or B.
- B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

C. Method "B" - Backfilling Under Sidewalks & Unpaved Driveways:

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner.

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner to avoid displacement of the pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.
2. The middle portion of the trench, from a point 12" above the top of the pipe to a point 6" below the grade line, shall be backfilled with material free from rock and/or acceptable to the Engineer. This material shall be placed and compacted in layers of approximately 6 inches. Water (puddling) may be used as required to obtain maximum compaction.
 - a. Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.
3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved Driveways:

Backfilling of pipeline trenches under streets, roads and paved driveways shall be accomplished in the following manner:

1. The lower portion of the trench from the pipe bedding to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with # 9 crushed stone.
2. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

- E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways shall be backfilled in accordance with Method "C". All methods are shown on the Detail Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

1. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.
2. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.06 SETTLEMENT OF TRENCHES

- A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner.

3.07 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASUREMENT

- A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the Specifications, or as directed by the Engineer.
- B. For cradle and encasement, concrete shall be 3000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.
- C. For thrust blocks and anchors, concrete shall be 3000 psi, and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.
- D. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.
- E. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

3.08 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

- A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.
- C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of six (6) inches in roads and streets and four (4) inches in driveways.

- D. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Drawings.

3.09 UNPAVED DRIVEWAY (CRUSHED STONE) SURFACE REPLACEMENT

- A. The Contractor shall replace those sections of existing driveways and parking areas required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Material for backfilling of the pipeline trench shall be dense-graded aggregate in accordance with Method "B" as described hereinbefore.

3.10 REMOVING AND REPLACING CONCRETE CURB AND GUTTER OR SIDEWALK

- A. The Contractor shall remove the curb and gutter or sidewalk when encountered when required for laying the pipe. Only that portion of the curb and gutter or sidewalk needed to lay the pipe shall be removed.
- B. Where concrete curb and gutter or sidewalk is removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than that which existed prior to the Contractor's operation.

3.11 REPLACEMENT OF EXISTING MAIL BOXES, CULVERTS, CLOTHES LINE POSTS, FENCES AND OTHER SUCH FACILITIES

- A. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.
- B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.12 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

- A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.
- B. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.
- C. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.13 RIP-RAP STREAM BANK SLOPE PROTECTION

- A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

3.14 TESTING

- A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 1.5 times the normal operating pressure of the pipe (at its lowest elevation), but not to exceed the rated working pressure of the pipe or valves. Note: Engineer shall verify test pressure. Loss of pressure during the test shall not exceed 0 psi in a 4 hour period and 5 psi in a 24 hour period. Any test results that do not meet either of these requirements shall constitute a failure of the pressure test.
- B. Leakage in pipelines, when tested under the hydrostatic test described above, shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe.
- C. Contractor shall furnish a recording gauge and water meter for measuring water used during leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24- hour spring wound clock, designed for 9-inch charts, and shall be approved by the Engineer.
- D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.
- E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.
- F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.
- G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.
- H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.
- J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.
- K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

3.15 CLEAN UP

- A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The

Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.16 DISINFECTION OF POTABLE WATER LINES

- A. The new potable waterlines shall not be placed in service--either temporarily or permanently--until they have been thoroughly disinfected in accordance with AWWA Standard C651-05, 2005 and to the satisfaction of the Engineer.
- B. After testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then may be connected to the system. Also, no additional payment will be allowed for providing taps for chlorine injection and/or flushing, if necessary. The Contractor is responsible for the disposal of highly chlorinated water flushed from the main.
- C. The new water line shall not be put into service until bacteriological samples taken at the points specified herein are examined and shown to be negative after disinfection, following the requirements of "Standard Methods for Examination of Water and Wastewater". Two consecutive sets of acceptable samples, taken at least 24 hours apart shall be collected from the new line. Samples are to be taken and tested at every 1200 feet of new water line, at each branch and at each dead end.
- D. If trench water has entered the pipe, or excessive quantities of dirt or debris have entered the pipe, samples shall be taken at intervals of approximately 200 feet and the locations identified. Samples shall be taken of water that has stood in the new line for at least 16 hours after flushing is completed.
- E. If the initial disinfection does not produce satisfactory bacteriological results, the new line shall be reflushed and resampled. If samples fail, the line shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained.
- F. All testing documentation shall be submitted to the Owner.

3.17 DECHLORINATION OF HEAVILY CHLORINATED WATER

- A. Dechlorination of heavily chlorinated water shall be in accordance with AWWA C651 and shall be accomplished using sodium bisulfite, sodium thiosulfate, sodium sulfite, or calcium thiosulfate solution of a concentration sufficient to remove all chlorine to a level not to exceed 0.019 mg/l. The solution shall be applied by a metering pump directly into the chlorinated water flow stream by injection into a discharge line or into the free discharge from a hydrant. The treated water may then be conveyed to the nearest sanitary sewer, storm sewer, or local stream.
- B. The feed rate (gpm) of solution shall be governed by the chlorine (ppm) concentration of the water to be dechlorinated and the rate (gpm) at which it can be discharged. Constant monitoring of the chlorine residual concentration shall be made using the colorimetric method to ensure the optimum solution feed rate.

- C. Feed System: The dechlorinating agent shall be fed from prepared carboys utilizing a metering pump equipped with a suitable meter and valve to adjust/monitor the feed rate. If trench water has entered the pipe, or excessive quantities of dirt or debris have entered the pipe, samples shall be taken at intervals of approximately 200 feet and the locations identified. Samples shall be taken of water that has stood in the new line for at least 16 hours after flushing is completed.

- END OF SECTION -

SECTION 331419
VALVES & HYDRANTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all hydrants and appurtenances specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 312200 – GRADING
- B. SECTION 331413 – WATER DISTRIBUTION PIPING

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with DIVISION 01 of this specification.
- B. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.
- C. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings & Specifications.

PART 2 - PRODUCTS

2.01 FLUSHING HYDRANTS

- A. The Contractor shall furnish and install fire hydrants and auxiliary gate valves where shown on the Drawings or directed by the Engineer. Hydrants shall conform in all respects to the most recent requirements of AWWA C502. Hydrant barrel shall have safety breakage feature above the ground line. All flushing hydrant, type 1 shall have 6-inch mechanical joint shoe connection, two (2) 2-1/2-inch discharge nozzles, and one (1) 4 1/2-inch pumper nozzle with rubber gasketed caps fitted with cap chains. All Flushing Hydrant, Type 2 shall have a 6-inch mechanical joint shoe connection and two (2) 2-1/2-inch discharge nozzles with rubber gasketed caps fitted cap chains. Cap nuts are to be five (5) sided. Connection threads shall be National Standard Thread. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains closed should barrel be broken off.
- B. Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.

- C. The operating nut shall be five (5) sided bronze or bronze with a five (5) sided ductile iron cap, and mounted so that a counter clockwise motion will open the valve. There must be cast on top an arrow and the word "Open" indicating the direction of turn to open the hydrant.
- D. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.
- E. Hydrants shall be shop tested to 300 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.
- F. Type of shoe connection shall be mechanical joint and size shall be six inches (6").
- G. Hydrants shall be given two (2) coats of enamel high visibility paint to be selected by the Owner.
- H. Hydrants shall be provided as described in DIVISION 01.

2.02 GATE VALVES

- A. Gate valves shall conform with AWWA C-509 standard, and shall be of the resilient seat type, iron body, fully bronze mounted, non-rising stem and have a design working pressure of 250 psi. All assembly bolts shall be stainless steel. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.
- B. All gate valves shall be furnished with mechanical joint connections, unless otherwise shown on the Drawings or specified hereinafter.
- C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.
- D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.
- E. Gate valves 12" and smaller shall be installed in a vertical position. Gate valves greater than 12" shall have the bonnet mounted in the horizontal position and have a bevel gear actuator. Gate valves shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counter-clockwise). All valve operating nuts shall be set within a cast iron valve box. There shall be a maximum 48" depth of valve operating nut. Contractor must use extension stems, if necessary, to raise operator nut within 48" of final grade.

2.02 GATE VALVES - BURIED

- A. Gate valves shall conform to the Specifications of Section 331219, Paragraph 2.2, except be designed for buried service, have mechanical joint ends, have all exterior surfaces shop painted with two coats of Fed. Spec. TT-V-51F Asphalt Varnish, with 2-inch square nut operator in a vertical position for use in a valve box.

2.03 VALVE BOXES - BURIED VALVES

- A. Valve boxes shall be of 5-1/4 inch standard cast iron, two-piece, screw type valve box with drop cover marked "WATER", "SEWER", "DRAIN", as applicable. Valve boxes for gate valves larger than 8 inches shall be three-piece. Valve boxes shall be accurately centered over valve operating nut, and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and in grass plots, fields, woods or other open terrain. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor, or equal.
- B. Wherever valve boxes fall outside of the pavement, the top of the box shall be set in a cast-in-place concrete slab 24" x 24" x 6" thick with the top of the slab and box flush with the top of the ground. This provision shall apply to all new and all existing valve boxes which fall within the limits of the contract, unless otherwise stated on the plans or ordered by the Engineer.

2.04 TAPPING SLEEVES AND VALVES

- A. DI tapping sleeves for use in connections to existing water lines, where indicated on the drawings or as directed by the Engineer, shall be constructed of ductile iron conforming to the requirements of ASTM A-536, and have the body of the tapping sleeve seal around the carrier pipe by use of mechanical joints on each end. Tapping outlet connections shall be flanged with drillings in accordance with ANSI class 125#/150#. Tapping sleeves shall be suitable for working pressures of 250 psi and shall be Mueller No. H-615, American Valve and Hydrant No. 2800-C, or approved equal.
- B. SST tapping sleeves for use in connections to existing water lines, where indicated on the drawings or as directed by the Engineer, shall have the body and neck constructed of ASTM A-240 type 304 stainless steel and shall be compressed to the carrier pipe by use of heavy gauge triangular sidebars running the length of the body. Bolts, nuts and washers shall be constructed of type 304 stainless steel. The gasket between the tapping sleeve and carrier pipe shall be constructed of Buna N rubber and be NSF 61 approved. The gasket shall have a grid pattern to help secure it in place and have seal around the full circumference of the pipe. Tapping outlet connections shall be constructed of ductile iron conforming to ASTM A-536 and have either a mechanical joint connection conforming to AWWA C-111, or a flanged connection with drillings in accordance with ANSI class 125#/150#. Tapping Sleeves shall be suitable for the following working pressures: 4"-12" 250 psi, 14"-24" 200 psi and shall be Mueller No. H-304, Romac Industries SST III, or approved equal.
- C. Tapping valves shall meet the requirements of paragraph 2.1 hereinbefore and shall be coordinated to connect to the tapping sleeve with either a flanged end or a mechanical joint end.
- D. All existing water mains to be tapped under this contract shall be exposed in order to verify line sizes prior to ordering tapping sleeves and valves.

PART 3 - EXECUTION

3.01 SETTING OF FIRE HYDRANTS

A. Location:

1. Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.
2. When placed behind the curb, the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of five feet (5') from the back of curb.
3. When set in the lawn space between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within six inches (6") of the sidewalk.

B. Position:

1. All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and shall have their nozzles parallel with the roadway, with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade, with nozzles at least eighteen inches (18") above the ground, as shown or as directed by the Engineer.

C. Connection to Main:

1. Each hydrant shall be connected to the main with a six-inch (6") restrained joint ductile iron branch controlled by an independent six -inch (6") gate valve, unless otherwise specified.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed course aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with uncrushed course aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

3.02 ANCHORAGE

- A. The bowl of each hydrant shall be tied to the pipe with suitable anchor couplings, as shown on the Standard Details in the Drawings or as directed by the Owner or Engineer.

3.03 FIRE HYDRANT WRENCHES

- A. One (1) hydrant wrench shall be furnished for each ten (10) hydrants or less. When the number of hydrants furnished and installed exceeds twenty-five (25), one (1) hydrant repair kit shall be supplied at no additional cost to the Owner.

3.04 INSTALLATION OF VALVES

- A. All valves shall be installed in accordance with details on the Contract Drawings and with the manufacturer's recommendations.
- B. All valves shall be anchored in accordance with the details on the Contract Drawings.

- END OF SECTION -

SECTION 331900
METERING EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes service pipelines constructed of CTS polyethelene tubing as shown on the Contract Drawings, complete with fittings and accessories.
- B. Certain features of the CTS tubing shall be as scheduled.
- C. The Contractor shall furnish all labor, tools, equipment, and materials necessary to complete the meter service connections as shown on the Contract Drawings and herein specified.

1.02 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American Water Works Association (AWWA)

1.03 SUBMITTALS

- A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:
 - 1. Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification.
 - 2. Layout drawings showing the location of copper tube including details of the support system, sleeves, unions and appurtenances.

PART 2 PRODUCTS

2.01 SERVICE CLAMPS

All service connections of all sizes shall be made through the use of service clamps or saddles. Service saddles shall have ductile iron body, double strapped with O-ring resilient gasket, suitable for use on ductile iron pipe or PVC pipe, and tapped with same threads as the corporation stops. Saddles for all mains shall be double strap type saddles and have a maximum working pressure of 350 psi SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

2.02 CORPORATION STOPS

Corporation stops for use in service clamps shall be equal for 3/4", 1" and 2" service tubing and have a maximum working pressure of 350 psi. Corporation stops shall have iron pipe threads with compression coupling connection for copper tubing outlets. A rigid stainless steel insert

stiffener shall be used inside the PE tubing, when encountered. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

2.03 SERVICE TUBING 3/4", 1" AND 2" POLYETHYLENE TUBING (CTS SERVICE TUBING)

- A. Pipe shall be made from virgin, ultra-high molecular weight polyethylene resin meeting the requirements of Type III, Class C, Category P34 polyethylene as defined by ASTM D-1248, latest revision, "Polyethylene Plastics Molding and Extrusion Materials".
- B. Dimensions and tolerances shall meet the values as listed in AWWA C-901, latest revision, "Polyethylene (PE) Pressure Pipe Tubing and Fittings". Standard dimension ratio shall be DR-7.3 (OD base), Pressure Class 200 psi.
- C. Pipe shall be rated for use with water at 73.4 degrees F. at a hydrostatic design stress of 630 psi and a maximum working pressure of 200 psi. The pipe shall sustain a water pressure as defined in ASTM D 1598 for 1000 hours with water at 73.4 degrees F.
- D. Surface shall be homogeneous inside and out and completely free of irregularity. Random testing shall be performed at intervals during all production runs to assure uniformity in all respects. The tubing shall carry the National Sanitation Foundation seal of approval for drinking water.
- E. Pipe shall be marked in lettering at intervals of not more than five (5) feet and such marking shall include nominal size; manufacturer's name or trademark; pressure rating for water at 73.4 degrees F., 200 psi; applicable ASTM specification,; ASTM material specification, PE 3406; standard dimension ratio, DR-7.3; the National Sanitation Foundation Seal of Approval (NSF mark) and production code.
- F. Pipe shall be guaranteed in writing against rot, corrosion and defects for 50 years from date of installation, with pipe replacement and labor cost warranted in writing for 25 years from date of installation.

2.04 RESERVED

2.05 METER SETTING EQUIPMENT

- A. Meters shall be placed inside meter boxes using coppersettlers with 3/4" or 1" saddle nut connection for the meter. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE. All coppersettlers shall have a ball angle meter valve (lockable) stop at the meter inlet and dual check valve on the outlet. coppersettlers shall be 12 inches in height with connections for the appropriate service tubing and have a maximum working pressure of 300 psi. .
- B. For larger meters (1-1/2" and 2") the meters shall be installed with ball meter valves on inlet side and the meter outlet side. Meters shall be placed on concrete block or equivalent support inside the meter box.
- C. For individual meter with pressure reducing valves or more than one meter the coppersettlers shall be the Tandem type coppersettlers as manufactured by Ford, Mueller or Engineer approved equal and 12 inches in height and placed in meter boxes with 18" I.D.
- D. A rigid stainless steel insert stiffener shall be used inside the PE tubing at all connections to the coppersettlers.

2.06 SERVICE METERS

The service meter main body shall be of high grade bronze, with hinges, single lid cover and raised characters cast on the body indicating the direction of flow. Meter shall have a working pressure rating of 150 psi. The register shall be straight reading gallon type. The register unit shall be hermetically sealed, and driven by permanent magnets. The register shall have a center sweep hand and a test circle shall be divided into 100 equal parts and include a flow finder. The register shall carry a minimum 10-year warranty.

The meters shall be manufactured by **Badger Radio Read**. The entire unit is to be pre-assembled in a workmanlike manner with all components fitted snugly into the box and fastened to prevent movement. All joints shall be sealed with Teflon tape. The inlet and outlet is to be equipped with compression couplings.

2.08 METER BOXES

Meter boxes shall be precast concrete with dimension as shown on the Drawings. The meter box where installation is to be roadways or sidewalks shall be of concrete construction for vehicular traffic. The meter box, cover and meter setting shall be constructed as shown on the drawings or as directed by the Owner or Engineer. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

2.08 ACCESSORIES

- A. Fittings and Couplings
 - 1. Fittings for copper tube shall be wrought copper or cast bronze for soldered joints and brass for flared joints.
 - 2. Flexible couplings as shown or required for copper tube shall be flexible metal hose couplings.
- B. Joints
 - 1. Joints for seamless copper water tube to be installed in concrete and underground shall be flared type and shall have threads in accordance with AWWA C 800.
 - 2. Joints for seamless copper water tube and copper drainage tube installed exposed and inside structures shall be soldered.
 - a. Solder and flux used in joints of water lines, shall contain no more than 0.2% lead.
 - b. Solder shall be Tin-Silver or approved equal.
 - c. Solder flux shall be as recommended by the solder manufacturer.
 - 3. Joints for bright annealed seamless copper tube used in liquid fuel lines shall have flared joints, approved by Underwriter's Laboratories.
 - 4. Joints for small tubing (3/8 inch and smaller) shall be of the locking type compression fittings or soldered as shown in the piping schedule and as directed.

PART 3 - EXECUTION

3.01 INSTALLATION OF METER SERVICES

All customer meter services shall be reconnected at the closest distance from the existing service line. All locations of the meters shown on the plans are approximate locations. The Owner reserves the right to change the location of the connections from the existing line to the new main.

3.02 INSTALLATION OF SERVICE TUBING

- A. All service tubing installed beneath bituminous or concrete roads shall be jacked under the roads. When State maintained roads are being jacked and rock is encountered, permission to open cut the road shall be obtained by the Contractor from the Department of Transportation's District Permit Engineer. If permission is refused, the Contractor shall attempt to jack at another location and shall continue to do so until a successful crossing is obtained.
- B. Minimum cover for all service lines shall be 36 inches (at all locations) when within the proposed and existing highway right-of-way and construction easements. Additional cover may be required at proposed drainage ditch, storm sewer, or other noted locations.

3.03 BACKFILLING SERVICE TUBING

When service tubing is laid in an open cut across a road of any type surface (crushed stone, bituminous or concrete), the backfill shall consist of Class II granular material (dense graded aggregate) and shall be placed full depth. Payment for Class II material used will not be paid as a separate pay item, but will be included in the price for installing the service tubing.

3.04 INSTALLATION OF COPPER TUBING (not in contract)

- A. Install copper tubing, fittings, specials, and accessories in accordance with the applicable configuration shown on the Contract Drawings and the provisions of the Sections entitled "Trenching, Backfilling and Compacting" and "Pipeline Installation".
- B. Exposed copper tube shall be carefully erected and neatly arranged.
 - 1. Copper tube shall be run parallel with walls inside structures and shall be pitched to drain.
 - 2. Drain valves shall be installed at the low points of liquid filled systems.
 - 3. Valved fill connections shall be provided for closed systems.
- C. Copper tube installed for a compressed air or gas system shall be pitched in the direction of flow.
 - 1. Connections shall be at the top of the main.
 - 2. Low points of the system shall have drip pipes not less than 12 inches long and drain pet-cocks unless automatic moisture traps are shown.
- D. Unions shall be provided on copper tube systems with soldered joints.

1. Unions shall be located at control valves, solenoid valves, moisture and steam traps, other items of connected equipment and as shown on Contract Drawings.
 2. Unions shall be of cast bronze or brass construction.
 3. Dielectric unions shall be used when connecting copper tube to ferrous metals.
- E. Copper tubing shall be supported and anchored in place by the use of copper or brass units spaced not greater than 10 feet on center and each side of each change of direction.

3.05 FIELD TESTING AND CHLORINATION

- A. Perform hydrostatic and leakage tests in accordance with the applicable provisions of the Section entitled "Leakage Tests", at the test pressure specified or scheduled.
- B. Disinfect piping and appurtenances in accordance with the Section entitled "Chlorination", where specified or scheduled.

-END OF SECTION-