

Project Manual for

**Pirtle Spring W.T.P., Gray Ln P.S.,
and Brizendine B.S. Improvements
Hardin County, Kentucky**

Owner:

**Hardin County Water District No. 1
1400 Rogersville Road
Radcliff, Kentucky 40160
www.HCWD.com**

CCI Project No. 00904-0010

January 2022

Set No. _____



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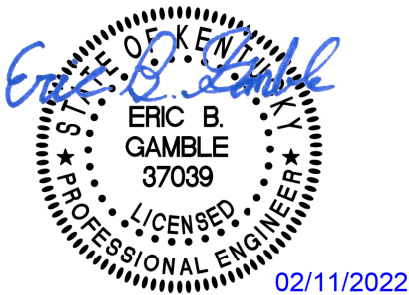
Set No. _____

**SECTION 00 01 05
CERTIFICATIONS**

The design firm(s) listed below are responsible for the preparation of **Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements**, Radcliff, Kentucky, Contract Documents, including corresponding Construction Drawings.

Cannon & Cannon, Inc.
8550 Kingston Pike
Knoxville, Tennessee 37919

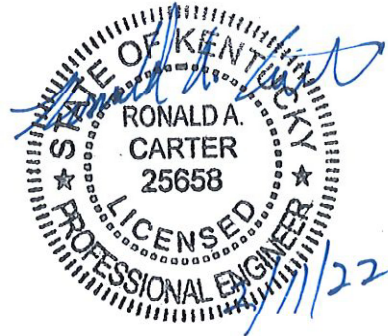
Divisions 0, 1, 2, 3, 5, 9, 22, 31, 32, 33
(excluding 33 09 30.01), 46
Project Drawings (excluding sheets E1.01-E3.02)



Eric B. Gamble, P.E.
Project Manager

West, Welch, Reed Engineers, Inc.
5417 Ball Camp Pike
Knoxville, Tennessee 37921

Division 26, Section 33 09 30.01
Electrical Project Drawings (sheets E1.01-E3.02)



Ronald Alan Carter, P.E.
Vice President

END OF SECTION 00 01 05

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Unless otherwise noted, this Project Manual follows the 2016 MASTERFORMAT Document Identifying System. Nonapplicable division and section references have been omitted.

Conflicts between any parts of the Contract Documents shall be brought to the OWNER’s attention prior to the receiving of bids.

The CONTRACTOR is responsible for verifying that all documents have been received.

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LIST OF DRAWINGS

The following List of Drawings outlines the construction drawings included in the **Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements, Hardin County, Kentucky**, Contract Documents. The CONTRACTOR is advised that this Project Manual, the drawings, and any and all or change orders related thereto, are hereby defined in whole as the “Contract Documents” and no separation of same will be considered.

Conflicts between any parts of the Contract Documents shall be brought to the OWNER’s attention prior to commencing construction.

The CONTRACTOR is responsible for verifying that all documents have been received.

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END OF SECTION 00 01 15

DIVISION 0: BIDDING AND CONTRACT REQUIREMENTS

SECTION 00 11 13
ADVERTISEMENT FOR BIDS

Sealed bids will be received by the **Hardin County Water District No. 1 (“Owner”)**, at **1400 Rogersville Road, Radcliff, Kentucky 40160** until **August 9, 2022 at 2:00 PM** Eastern Time, for the project named ***Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements*** in Radcliff, KY.

The Issuing Office for the Bidding Documents is: **Lynn Imaging, 11460 Bluegrass Pkwy, Louisville, KY 40299, 502-499-8400**. Bidding Documents will be available for order online at <https://www.lynnimaging.com/distribution>. For ordering assistance please call **800-888-0693**. Only those entities that obtain copies of the Contract Documents from Lynn Imaging will be eligible to bid.

A MANDATORY pre-Bid conference will be held **July 20, 2022 at 10:00 AM** Eastern Time at the Hardin County Water District No. 1 Service Center 1400 Rogersville Road, Radcliff, Kentucky 40160. The deadline to submit questions is **August 3, 2022 at 5:00 PM** Eastern Time; all questions shall be sent in writing, no verbal questions or responses will be accepted.

All bids must be in a sealed envelope and clearly marked ***“Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements.”*** The Owner reserves the right to reject any or all bids and to waive any formalities. The Owner invites any qualified Bidder to submit a bid and does not discriminate on the basis of race, creed, color, sex, or national origin. Small Businesses or sub-categories of small businesses are encouraged to submit a bid. For any additional information regarding this project please contact Eric Gamble, P.E. at 865-770-4034 or by email at egamble@cannon-cannon.com.

END OF SECTION 00 11 13

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS
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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. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office* – The office from which the Bidding Documents are to be issued.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

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 All Bidders are directed to Section 00 45 13, “Qualifications Statement”. Bidder shall complete the form provided and include it within the Bid Package. Failure to meet this requirement may result in disqualification of the Bidder.

3.02 To demonstrate Bidder’s qualifications to perform the Work, after submitting its Bid and within 5 days of Owner’s request, Bidder shall submit (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:

~~A. Evidence of Bidder’s authority to do business in the state where the Project is located.~~

~~B. Bidder’s state or other contractor license number, if applicable.~~

C. Subcontractor and Supplier qualification information.

3.03 A Bidder’s failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.04 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder’s qualifications.

3.05 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. The Supplementary Conditions identify:
 - a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
 - b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
 - c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
4. ~~Geotechnical Baseline Report: The Bidding Documents contain a Geotechnical Baseline Report (GBR). The GBR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations ("Baseline Conditions"). The GBR is a Contract Document.~~

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

~~Nothing in the GBR 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 *Safety Program*

- A. Site visits and work at the Site **shall** be governed by **OSHA laws and regulations**. 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 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. 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 A pre-Bid conference will be held at the time and location stated in the invitation or advertisement to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda 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 61 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 a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

- 11.01 The Contract for the Work, as 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 7 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.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

~~12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.~~

~~12.02 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.~~

12.03 **If required by the bid documents,** The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for ~~the following 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, in which case apparent Successful Bidder shall submit a substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

12.04 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.

12.05 **Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.**

12.06 **The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 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 **or typed** 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 **or typed** 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.~~

ARTICLE 14 – BASIS OF BID

- 14.01 Lump Sum
- A. Bidders shall submit a Bid on a lump sum basis as set forth on the Bid Form.
 - B. The value of OWNER furnished materials shall not be included in the Lump Sum Base Bid.
 - C. If indicated on the Bid Form, unit price data is to be provided for all units listed to allow contract price adjustment based on Change Order.
- 14.02 The total Bid Price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances named in the Contract Documents as provided in paragraph 13.02 of the General Conditions.

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." A mailed Bid shall be addressed to **Hardin County Water District No. 1, ATTN: Daniel Clifford, 1400 Rogersville Rd, Radcliff, Kentucky 40160.**

- 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 Evaluation of Bids
- A. 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.
 - ~~B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.~~

- 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.

END SECTION 00 21 13

SECTION 00 41 13 BID FORM

Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements

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ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

**Hardin County Water District No. 1
ATTN: Daniel Clifford
1400 Rogersville Rd
Radcliff, KY 40160**

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 ~~60~~ **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 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. 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.

- F. 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.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has 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.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. 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 any thing 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):

Item No.	Description	Est Qty	Unit	Unit Price	Total Price
1.	Gray Lane Pump Station; inclusive of: furnishing all products, materials and equipment; and performing all labor necessary to complete and put into operation Gray Lane Pump Station, including all work shown or described in the Drawings and/or specifications.			LUMP SUM	
2.	Brizendine Booster Pump Station; inclusive of: furnishing all products, materials and equipment; and performing all labor necessary to complete and put into operation Brizendine Booster Pump Station, including all work shown or described in the Drawings and/or specifications.			LUMP SUM	
3.	Pirtle Spring Water Treatment Plant – Filter No. 4; inclusive of: furnishing all products, materials and equipment; and performing all labor necessary to complete and put into operation Pirtle Spring Water Treatment Plant – Filter No. 4, including all work shown or described in the Drawings and/or specifications.			LUMP SUM	
4.	Pirtle Spring Water Treatment Plant – Clarifier Steps; inclusive of: furnishing all products, materials and equipment; and performing all labor necessary to complete and put into operation Pirtle Spring Water Treatment Plant – Clarifier Steps including all work shown or described in the Drawings and/or specifications.			LUMP SUM	
5.	Allowance: Upgraded electrical service to the Gray Lane Pump Station. Work to be performed by electric utility.			LUMP SUM	\$7,000
6.	Allowance: Upgraded electrical service to the Brizendine Booster Pump Station. Work to be performed by electric utility			LUMP SUM	\$5,000
TOTAL					\$

BID TOTAL – ITEMS 1 THROUGH 6, INCLUSIVE, THE AMOUNT OF

_____ Dollars _____ Cents

(\$ _____)

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 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. Required Bidder Qualifications Statement (Section 00 45 13) with supporting data;
 - F. Non-Collusion Affidavit of Prime Bidder, Section 00 45 19

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)

END OF SECTION 00 41 13

**SECTION 00 43 13
BID SECURITY FORM**

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): **Hardin County Water District No. 1
1400 Rogersville Road
Radcliff, Kentucky 40160**

BID

Bid Due Date: Month day, 2022

Project (Brief Description Including Location):

A. Gray Lane Pump Station: The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES demolition of existing station, boring and installation of well casing, concrete pad for platform, platform with canopy, pump, piping, testing, instruments, electrical controls, electrical service, fencing, SCADA integration, and associated grading and erosion controls. Brizendine Pump Station: The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES pump, vault, piping, testing, electrical controls, fencing, SCADA integration, and associated grading and erosion controls. Pirtle Spring Water Treatment Plant – Filter No. 4: The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES filter underdrain, waste water troughs, filter media, air piping, instrumentation, and SCADA integration. Pirtle Spring Water Treatment Plant – Clarifier Steps: The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES demolition of existing stairs and walkway and installation of aluminum stairs and walkway over clarifier 1 and 2. The work shall be completed in strict accordance with the drawings and the Contract Documents.

BOND

Bond Number:

Date (Not later than Bid due date):

Penal sum

(Words)

(Figures)

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

BIDDER

SURETY

Bidder's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature and Title

By: _____
Signature and Title

(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

Note: Above addresses are to be used for giving 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 prepaid, 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.

END OF SECTION 00 43 13

COMPLIANCE STATEMENT

This statement relates to a proposed contract with Hardin County Water District No. 1

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. I have, have not, participated in a previous contract or subcontract subject to Executive 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I have, have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that:

3. I have, have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I have, have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)



Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion AD-1048 Lower Tier Covered Transactions

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552a, as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 C.F.R. §§ 180.300, 180.335, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

According to the Paperwork Reduction Act of 1995 an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of appropriate criminal, civil, fraud, privacy, and other statutes may be applicable to the information provided.

(Read instructions on page two before completing certification.)

- A. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;
B. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Form with fields: ORGANIZATION NAME, PR/AWARD NUMBER OR PROJECT NAME, NAME(S) AND TITLE(S) OF AUTHORIZED REPRESENTATIVE(S), SIGNATURE(S), DATE

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint (https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442.

Instructions for Certification

- (1) By signing and submitting this form, the prospective lower tier participant is providing the certification set out on page 1 in accordance with these instructions.
- (2) The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension or debarment.
- (3) The prospective lower tier participant shall provide immediate written notice to the person(s) to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- (4) The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
- (5) The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- (6) The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- (7) A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the System for Award Management (SAM) database.
- (8) Nothing contained in the foregoing shall be construed to require establishment of a system of records to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- (9) Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

(name)

(date)

(title)

oOo

Instructions for Certification

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principles. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly entered into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Form AD-1048 (1/92)

**SECTION 00 45 19
NON-COLLUSION AFFIDAVIT OF PRIME BIDDER**

I certify that I have not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this proposal or contract.

Signature by the bidder in that space provided below shall in addition be considered, and shall have the same legal effect, as the bidder's signature on the certifications set forth on Section 00 41 13. The signature below must be sworn to before a person authorized by the laws of a State to administer oaths.

_____ Company

By _____

_____ Title

_____ Address

_____ Address

STATE OF _____

COUNTY OF _____

On this the _____ day of _____, _____, personally

appeared before me _____, to me personally

known, who being duly sworn, did depose and say that he/she resides in _____

state of _____ and that he/she is the _____

of _____ described herein and which executed the above agreement

and that he/she signed pursuant to proper authority and authorization

END OF SECTION 00 45 19

00 51 00

NOTICE OF AWARD

Date of Issuance:

Owner: Hardin County Water District No. 1 Owner's Contract No.:

Engineer: Cannon & Cannon, Inc. Engineer's Project No.: 00904-0010

Project: Pirtle Spring W.T.P., Gray Ln P.S., Contract Name: N/A
and Brizendine B.S. Improvements

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:

[describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is: \$ _____ *[note if subject to unit prices, or cost-plus]*

Four 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 receipt of this Notice of Award:

1. Deliver to Owner **four** 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: Hardin County Water District No. 1

Authorized Signature

By:

Title:

Copy: Engineer

END OF SECTION 00 51 00

January 2022

00 51 00 – 1

00904-0010
Notice of Award

SECTION 00 52 13 - AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between Hardin County Water District No. 1 (“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:

Improvements at three locations within the Owner’s system: 1. Pirtle Spring Water Treatment Plant to Filter No. 4 to place the existing filter bay in operation, and improvements the exterior walkway over the clarifiers.; 2. Gray Lane Pump Station to increase capacity by replacing the existing groundwater well, pump, controls, equipment, structure, and site improvements. 3. Replace the existing control valve vault with the new Brizendine Booster Pump Station with new vault, pumps, controls, equipment, and site improvements. The Work includes all demolition, grading, temporary facilities, electrical services, equipment, structures, site improvements, SCADA integration, and miscellaneous appurtenances for a complete installation at each location. The work shall be completed in strict accordance with the drawings and the Contract Documents.

ARTICLE 2 – THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements**

ARTICLE 3 – ENGINEER

- 3.01 The Project has been designed by **Cannon & Cannon, Inc.**
- 3.02 The Owner has retained **Cannon & Cannon, Inc.** (“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 **240** 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 **270** 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 **\$500** 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 Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$500** 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. ~~Milestones: Contractor shall pay Owner \$_____ for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved.~~

~~B. *Bonus*: Contractor and Owner further recognize the Owner will realize financial and other benefits if the Work is completed prior to the time specified for Substantial Completion. Accordingly, Owner and Contractor agree that as a bonus for early completion, Owner shall pay Contractor \$_____ for each day prior to the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract) that the Work is substantially complete. The maximum value of the bonus shall be limited to \$_____.~~

4.04 **[DELETED]**

ARTICLE 5 – CONTRACT PRICE

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

A. For all Work, a Lump Sum of:

_____ (\$_____)

All specific cash allowances are included in the above price and have been computed in accordance with paragraph 13.02 of the General Conditions.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 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 **15th** day 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. **95** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
 - B. Upon Substantial Completion of the entire construction to be provided under the Contract Documents, 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 **95** 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 –Not Applicable

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 7, inclusive).
 2. Performance bond (pages ___ to ___, inclusive).
 3. Payment bond (pages ___ to ___, inclusive).
 4. Other bonds.
 - a. (pages to , inclusive).
 5. General Conditions (pages to , inclusive).
 6. Supplementary Conditions (pages to 15, inclusive).
 7. Specifications as listed in the table of contents of the Project Manual.
 8. the Drawings listed **in Section 00 01 15. on the attached sheet index.**
 9. Addenda (numbers to , inclusive).
 10. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages to , inclusive).
 11. 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).

1.

OWNER:

CONTRACTOR:

By: _____

By: _____

Title: _____

Title: _____

(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:

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.

CERTIFICATE OF OWNER'S ATTORNEY AND AGENCY CONCURRENCE

CERTIFICATE OF OWNER'S ATTORNEY

PROJECT NAME: _____

CONTRACTOR NAME: _____

I, the undersigned, _____, the duly authorized and acting legal representative of _____, 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; and that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the forgoing 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 the 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

ENGINEER'S CERTIFICATION ON FINAL PLANS AND SPECIFICATIONS

PROJECT NAME: _____

The final Drawings and Specifications, other assembled Construction Contract Documents, bidding-related documents (or request for proposals or other construction procurement documents), and any other Final Design Phase deliverables, comply with all requirements of the US Department of Agriculture, Rural Utilities Service, to the best of my knowledge and professional judgement.

If the EJCDC documents have been used, all modifications required by Kentucky Bulletin 1780-1 have been made in accordance with the terms of the license agreement, which states in part that the Engineer "must plainly show all changes to the Standard EJCDC text, using "Track Changes" (redline/strikeout), highlighting, or other means of clearly indicating additions and deletions." Such other means may include attachments indicating changes (e.g. Supplementary Conditions modifying the General Conditions).

Engineer

Date

Name and Title

NOTICE TO PROCEED

Owner:	Hardin County Water District No. 1	Owner's Contract No.:	N/A
Contractor:		Contractor's Project No.:	
Engineer:	Cannon & Cannon, Inc.	Engineer's Project No.:	00904-0010
Project:	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements	Contract Name:	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements
		Effective Date of Contract:	

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [_____, 20__]. *[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 _____] **or** [the number of days to achieve Substantial Completion is _____, and the number of days to achieve readiness for final payment is _____].

Before starting any Work at the Site, Contractor must comply with the following:
[Note any access limitations, security procedures, or other restrictions]

Owner:

Authorized Signature

By:

Title:

Date Issued:

Copy: Engineer

PERFORMANCE BOND

CONTRACTOR *(name and address):*

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

OWNER *(name and address):* Hardin County Water District No. 1
1400 Rogersville Road
Radcliff, KY 40160

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):* Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements
Hardin County, KY

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

(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: _____
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)*: Hardin County Water District No. 1
1400 Rogersville Rd
Radcliff, KY 40160

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: Pirtle Spring W.T.P., Gray Ln P.S., & Brizendine B.S. Improvements - Hardin County, KY

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: _____
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 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.
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
 - 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.
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
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 00 62 16
CERTIFICATES OF INSURANCE FORM

Insurance Certificates as specified in Section 00 72 00 GENERAL CONDITIONS and in Section 00 73 00 SUPPLEMENTARY CONDITIONS shall be inserted behind this page. Sample forms are provided to show amounts requested by Section 00 73 00.

END OF SECTION 00 62 16

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

PRODUCER XYZ Center of Insurance PO Box XXXX City, State Zip	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.												
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COVERAGES

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		GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> INCLUDES XCU COVERAGES GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PROJECT <input type="checkbox"/> LOC	XXX000	00-00-00	00-00-00	EACH OCCURRENCE \$ 2,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 100,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 2,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000												
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DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS RE: Project Title	ADDITIONAL INSURED: Owner's Name Engineer's Name
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CERTIFICATE HOLDER Owner's Name Address City, State Zip	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL [REDACTED] MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT. [REDACTED] [REDACTED] AUTHORIZED REPRESENTATIVE
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ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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COVERAGES
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DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

RE: Project Title

CERTIFICATE HOLDER Owner's Name Address City, State Zip	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL [REDACTED] MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT. [REDACTED] [REDACTED] [REDACTED]
AUTHORIZED REPRESENTATIVE	

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

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PRODUCER XYZ Center of Insurance PO Box XXXX City, State Zip	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.												
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DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS RE: Project Title	ADDITIONAL INSURED: Owner's Name Engineer's Name
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CERTIFICATE HOLDER Owner's Name Address City, State Zip	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL _____ MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT. _____ _____ AUTHORIZED REPRESENTATIVE
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 City, State Zip

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

INSURERS AFFORDING COVERAGE

NAIC #

INSURED
 Owner's Name
 Address
 City, State Zip

INSURER A: A B C Company
 INSURER B: D E F Company
 INSURER C:
 INSURER D:
 INSURER E:

COVERAGES

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

INSR LTR	ADD'L INSR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
		GENERAL LIABILITY <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> OWNER'S & CONT. PROT GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC	XXXOOO	00-00-00	00-00-00	EACH OCCURRENCE	\$
						DAMAGE TO RENTED PREMISES (Ea occurrence)	\$
						MED EXP (Any one person)	\$
						PERSONAL & ADV INJURY	\$
						GENERAL AGGREGATE	\$ 1,000,000
						PRODUCTS - COMP/OP AGG	\$
		AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON-OWNED AUTOS				COMBINED SINGLE LIMIT (Ea accident)	\$
						BODILY INJURY (Per person)	\$
						BODILY INJURY (Per accident)	\$
						PROPERTY DAMAGE (Per accident)	\$
		GARAGE LIABILITY <input type="checkbox"/> ANY AUTO				AUTO ONLY - EA ACCIDENT	\$
						OTHER THAN EA ACC	\$
						AUTO ONLY: AGG	\$
		EXCESS/UMBRELLA LIABILITY <input type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE <input type="checkbox"/> DEDUCTIBLE <input type="checkbox"/> RETENTION \$				EACH OCCURRENCE	\$
						AGGREGATE	\$
							\$
							\$
		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				WC STATU-TORY LIMITS	OTH-ER
						E.L. EACH ACCIDENT	\$
						E.L. DISEASE - EA EMPLOYEE	\$
						E.L. DISEASE - POLICY LIMIT	\$
		OTHER					

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

RE: Project Title

CERTIFICATE HOLDER

Owner's Name
 Address
 City, State Zip

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL _____ MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT. _____

AUTHORIZED REPRESENTATIVE



Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

**Application For Payment
Change Order Summary**

Number	Additions	Deductions	
Approved Change Orders			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)

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Hardin County Water District No. 1	Owner's Contract No.:	N/A
Contractor:		Contractor's Project No.:	
Engineer:	Cannon & Cannon, Inc.	Engineer's Project No.:	00904-0010
Project:	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Contract Name: Improvements		

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.

EXECUTED BY ENGINEER:	RECEIVED:	RECEIVED:
By: _____ (Authorized signature)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

**SECTION 00 65 19.13
AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS**

To Owner: <i>(Name and address)</i>	Hardin County Water District 1 1400 Rogersville Rd. Radcliff, KY 40160	CCI Project No.:	00904-0010
Project: <i>(Name and address)</i>	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements Hardin Co., KY	Contract For:	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements Contract Dated: (Date)

The CONTRACTOR hereby certifies that to the best of the CONTRACTOR’s knowledge, information, and belief, except as listed below, all obligations for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the undersigned for damages arising in any manner in connection with the performance of the Work referenced above for which **(Owner)** or its property might in any way be held responsible have been paid in full or upon receipt of Final Payment in accordance with Paragraph 14.07 of the General Conditions will be paid in full or otherwise satisfied; and hereby unconditionally waives, releases and relinquishes all of its rights and covenants to commence an action for or to file any type of lien against **(Owner)** or its property for such labor, equipment, and/or materials so furnished by the CONTRACTOR.

The CONTRACTOR further agrees to reimburse and does hold harmless and fully indemnify OWNER and its successors and assigns for any losses or expenses should any such claim, lien, or right to a lien be asserted by the CONTRACTOR or by any person or entity acting for or claiming by, through or under the CONTRACTOR, including, without implied limitation, attorney’s fees incurred in the defense thereof.

The CONTRACTOR further attests that with respect to this Contract all required taxes have been set aside and have been paid or will be paid when due, and all employer contributions required to be paid under labor agreements have been paid or will be paid when due.

Exceptions:

Contractor: <i>(Name and address)</i>	Name Address City, State, Zip	Subscribed and sworn to before me on this date:	_____
By:	_____ <i>(Signature of authorized representative)</i>	Notary Public:	_____
	_____ <i>(Printed name and title)</i>	My Commission expires:	_____

END OF SECTION 00 65 19.13

**SECTION 00 65 19.16
CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS**

To Owner: <i>(Name and address)</i>	Hardin County Water District 1 1400 Rogersville Rd. Radcliff, KY 40160	CCI Project No.:	00904-0010
Project: <i>(Name and address)</i>	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements Hardin Co., KY	Contract For:	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements
		Contract Dated:	

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed blow, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of material and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

Exceptions:

Contractor:
(Name and address)

Subscribed and sworn to
before me on this date: _____

By: _____
(Signature of authorized representative)

Notary Public: _____

(Printed name and title)

My Commission expires: _____

END OF SECTION 00 65 19.16

**SECTION 00 65 19.19
CONSENT OF SURETY TO FINAL PAYMENT**

To Owner: <i>(Name and address)</i>	Hardin County Water District 1 1400 Rogersville Rd. Radcliff, KY 40160	CCI Project No.:	00904-0010
		Contract For:	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements
Project: <i>(Name and address)</i>	Pirtle Spring W.T.P., Gray Ln P.S., and Brizendine B.S. Improvements Hardin Co., KY	Contract Dated:	

In accordance with the provisions of the above-named contract between the Owner and the Contractor, the following named surety:

on the Payment Bond of the following named Contractor:

hereby approves of final payment to the Contractor, and further agrees that said final payment to the Contractor shall not relieve the surety company named herein of any of its obligations to the following named Owner: as set forth in said surety company's bond:

IN WITNESS WHEREOF, the surety company has hereunto set its hand and seal this _____ day of _____ 20__.

END OF SECTION 00 65 19.19

00 72 00
STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



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**STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT**

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, 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. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
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 CONDITIONS

5.01 *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.H 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 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 11.01.C.2.a and 11.01.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 special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, 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 00 73 00

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

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

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

SC-1.01 Defined Terms

- A. SC 1.01.A.3 Add the following language at the end of last sentence of Paragraph 1.01.A.3:
The Application for Payment form to be used on this project is EJCDC C-620 (2013), or RD Form 1927-7.
- B. SC 1.01.A.8 Add the following language at the end of last sentence of Paragraph 1.01.A.8:
The Change Order form to be used on this Project is EJCDC C-941 or RD Form 1927-7. Agency approval is required before Change Orders are effective or eligible for payment.
- C. SC 1.01.A.26 Add the following sentence to the end of paragraph 1.01.A.26. “When requested by OWNER, the Notice of Award may be issued by ENGINEER.”
- D. SC 1.01.A.27 Add the following sentence to the end of paragraph 1.01.A.27. “When requested by OWNER, the Notice to Proceed may be issued by ENGINEER.”
- E. SC 1.01.A.38 Add the following language at the end of the last sentence of paragraph 1.01.A.38. “Specifications shall include but not be limited to the information contained in the Project Manual, notes contained on the construction drawings, and reference to other standards and specifications contained in Contract Documents.”
- F. SC 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.
- G. SC 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.
- H. SC 1.01.A.50 Add the following new Paragraph after Paragraph 1.01.A.49:

50. Agency - The Project is financed in whole or in part by USDA Rural Utilities Service pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.). The Rural Utilities Service programs are administered through the USDA Rural Development offices; therefore, the Agency for these documents is USDA Rural Development.

- I. SC 1.01.A.51 Add the following new paragraph after paragraph 1.01.A.48:

51. Project Manual – The volume of written construction documents, including the Bidding Documents, sample forms, and the Contract Documents, such as the General Requirements of the Construction Contract and the technical Specifications.

ARTICLE 2 – PRELIMINARY MATTERS

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

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

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

- A. SC-3.05.B. Amend the last sentence of paragraph 3.05.B by striking the word “copies” and inserting in its place “one original signed copy.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

- A. SC-4.01.A. Amend the last sentence of Paragraph 4.01.A by striking out the following words:

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.

- B. SC 4.05.C.2 Amend Paragraph 4.05.C.2 by striking out the following text: “abnormal weather conditions;” and inserting the following text:

Abnormal Weather Conditions;

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

- A. SC 5.01.A. Amend the first sentence of paragraph 5.01.A by striking the work “Site” and inserting in its place “lands upon which the Work is to be performed and such other lands as are designated for the use of the CONTRACTOR.”

- B. SC 5.01.C. Add the following new paragraph immediately after paragraph 5.01.C:

D. Access to area outside the Project Rights-of-way may be required to access the Project. The CONTRACTOR shall work with each individual landowner to make necessary arrangements to gain access to the Project Right-of-way. The CONTRACTOR

shall provide releases from the landowners in a form acceptable to the ENGINEER and OWNER, substantiating that the CONTRACTOR has satisfied all requirements for damages and other arrangements. Easements may not be used until the OWNER approves all releases in writing.

- B. SC 5.03 Delete Paragraphs 5.03.A and 5.03.B in their entirety and insert the following:
 - A. No reports of explorations or tests of subsurface conditions at or adjacent to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.
- C. SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:
 - A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.
 - B. Not Used.

ARTICLE 6 – BONDS AND INSURANCE

- A. SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:
 - K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
 1. Workers’ Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions – In accordance with the Laws of the State.
 2. Contractor’s Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

Each Occurrence	\$	<u>2,000,000</u>
Damages to Rented Premises (Ea. occurrence)	\$	<u>100,000</u>
Medical Expense (any one person)	\$	<u>5,000</u>
Personal and Adv Injury	\$	<u>2,000,000</u>
General Aggregate	\$	2,000,000
Products – Comp/OP Aggregate	\$	2,000,000
3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:		
Bodily Injury:		
Each person	\$	<u>1,000,000</u>
Each accident	\$	<u>1,000,000</u>
Property Damage:		

Each accident	\$ <u>1,000,000</u>
<i>[or]</i>	
Combined Single Limit of	\$ <u>1,000,000</u>
4. Excess or Umbrella Liability:	
Per Occurrence	\$ <u>2,000,000</u>
General Aggregate	\$ <u>2,000,000</u>

B. SC 6.04 Delete paragraph 6.04 in its entirety and insert the following in its place:

6.04 *OWNERS and CONTRACTORS Protective (OCP) Insurance*

- A. The CONTRACTOR shall be responsible for purchasing and maintaining the Owners and Contractors Protective (OCP) Insurance to protect the OWNER against claims which may arise from operations under the Contract Documents.
- B. This insurance shall be in the form of a separate policy written in the name of the OWNER.
- C. The limits of liability for the insurance required by Paragraph 5.05 of the General Conditions shall provide coverage for not less than the following amounts:
 - 1. General Liability
 - a. General Aggregate \$1,000,000
 - b. Each occurrence \$1,000,000

C. SC 6.06.B. Delete paragraph 6.06.B in its entirety

D. SC 6.06.C. Delete paragraph 6.06.C in its entirety

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

A. SC-7.03.D. Add the following new paragraph immediately after 7.03.C:

D. CONTRACTOR will assume full responsibility for all OWNER Furnished Materials upon receipt from OWNER’s warehouse, material vendor/suppliers, or on site. All possible methods shall be taken to ensure the care and protection of all materials from damage during handling, storage, or from weather. Materials damaged due to negligence and/or improper handling will be charged to the CONTRACTOR at the OWNER’s present stock value. No charge will be made for material items returned to the OWNER which, in the opinion of the OWNER or the ENGINEER, were not damaged in removal and handling even though the materials may not be reusable for reasons of obsolescence or deterioration. Do not place removed materials or equipment where it will be damaged by or cause damage to vehicular traffic, livestock, persons and property. Immediately remove from the job site.

- B. SC-7.04.A. Amend the third sentence of Paragraph 7.04.A by striking out 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.
- C. SC 7.04.A.1 Amend the last sentence of Paragraph a.3 by striking out "and;" and adding a period at the end of the Paragraph.
- D. SC 7.04.A.1 Delete paragraph 7.04.A.1.a.4 in its entirety and insert the following in its place:
[Deleted]
- E. SC 7.06.A 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).
- F. SC 7.06.B Delete paragraph 7.06.B in its entirety and insert the following in its place:
[Deleted]
- G. SC 7.06.E Amend the second sentence of Paragraph 7.06.E by striking out "Owner may also require Contractor to retain specific replacements; provided, however, that".
- H. SC7.08.A Add the following language at the end of the last sentence of paragraph 7.08.A:
"CONTRACTOR is advised they are responsible for filing the appropriate notification from with the State regarding storm water runoff compliance."
- I. SC7.09 Add the following new paragraph immediately after 7.09.A:
B. OWNER is exempt from payment of sales and compensating use taxes of the State of Kentucky and of cities and counties thereof on all materials to be incorporated into the Work.
1. OWNER will furnish the required certificates of tax exemption to CONTRACTOR for use in the purchase of supplies and materials to be incorporated into the Work.
2. OWNER's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by CONTRACTOR, or to supplies or materials not incorporated into the Work.
- J. SC7.16 Add the following new paragraphs immediately after Paragraph 7.16.E:
F. CONTRACTOR shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than two submittals. ENGINEER will record ENGINEER's time for reviewing subsequent submittals of Shop Drawings, samples or other items required approval and CONTRACOTR shall reimburse OWNER for ENGINEER's charges for such time.
G. In the event that CONTRACTOR requests a substitution for a previously approved item, CONTRACTOR shall reimburse OWNER for ENGINEER's charges for such time unless the need for such substitution is beyond the control of CONTRACTOR.

ARTICLE 8 – OTHER WORK AT THE SITE – NO AMENDMENTS

ARTICLE 9 – OWNER’S RESPONSIBILITIES – NO AMENDMENTS

ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION

- A. SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.A:
- B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.
1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.
 2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
 3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
 4. Liaison:
 - a. Serve as Engineer’s liaison with Contractor. Working principally through Contractor’s authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner’s liaison with Contractor when Contractor’s operations affect Owner’s on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
 5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
 6. Shop Drawings and Samples:
 - a. Record date of receipt of Samples and Contractor-approved Shop Drawings.
 - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

- c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.
7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
8. Review of Work and Rejection of Defective Work:
 - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
9. Inspections, Tests, and System Start-ups:
 - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
 - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
10. Records:
 - a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.
 - b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
 - c. Maintain records for use in preparing Project documentation.

11. Reports:
 - a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.
 - b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
 - c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.
 12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
 13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
 14. Completion:
 - a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.
 - b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.
 - c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.
- C. The RPR shall not:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
 3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.
5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.

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

- A. SC 11.07.C Add the following new Paragraph after Paragraph 11.07.B:

All Contract Change Orders must be concurred in by Agency before they are effective or can be eligible for reimbursement.

- B. SC 11.09 Add the following new paragraph immediately following paragraph 11.08:

11.09 Owner's Change in Work

1. Without invalidating the Agreement, OWNER may, at any time execute appropriate Change Orders for additions and/or deletions in the Work of up to twenty-five (25) percent of the total Contract amount, without a change in the contract unit prices bid.

ARTICLE 12 – CLAIMS

- A. SC 12.01.D.1 Add the following language at the end of Paragraph 12.01.D.1:

All mediation or court action shall be held in Hardin County, KY.

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

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

[Deleted]

- C. SC 13.03.E Delete paragraph 13.03.E in its entirety and insert the following in its place:

E. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:

1. if the Bid price of a particular item of Unit Price Work amounts to 10 percent or more of the Contract Price and the variation in the quantity of that particular item

- of Unit Price Work performed by CONTRACTOR differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and,
2. if there is no corresponding adjustment with respect to any other item of Work; and,
 3. if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof or if OWNER believes the quantity variation entitles OWNER to an adjustment in the unit price, either OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with Article 10 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

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

- A. SC 14.02.B Delete paragraph 14.02.B in its entirety
- B. SC 14.02.G Add the following new paragraph immediately after paragraph 14.02.F:
 - G. The OWNER will pay for all testing and inspecting specifically requested by the ENGINEER over and above those described in the Contract Documents. When tests requested by the ENGINEER indicate noncompliance with the Contract Documents, all testing and subsequent re-resting occasioned by the noncompliance shall be performed by the same testing laboratory and the costs thereof shall be paid by the CONTRACTOR.

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

- A. SC 15.01.B Amend the second sentence of Paragraph 15.01.B.1 by striking out the following text: “a bill of sale, invoice, or other.”
- D. SC 15.01.B.3 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.
- E. SC 15.01.B.4 Add the following new Paragraph after Paragraph 15.01.B.3:

The Application for Payment form to be used on this Project is EJCDC C-620 unless another form is agreed upon by the Engineer, Owner, and Agency. The Agency must approve all Applications for Payment before payment is made.
- F. SC 15.01.D.1 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 and Agency for consideration. If both the Owner and Agency 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.

- G. SC 15.02.A Amend Paragraph 15.02.A by striking out the following text: “no later than seven days after the time of payment by Owner” and insert “no later than the time of payment by Owner.”
- H. SC 15.08.E Add the following new paragraph immediately after paragraph 15.08.E:
 - F. Specific and special warranties specified in the Contract Documents are in addition to, and not in lieu of, the CONTRACTOR’s general warranty. CONTRACTOR shall not be relieved of general warranty obligations by the specification of specific products or procedures.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION – NO AMENDMENTS

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

- I. SC 17.01 Delete Paragraph 17.01 in its entirety and insert the following in its place:

17.01 Methods and Procedures

- A. All claims, disputes and other matters in question between Owner and Contractor arising out of, or relating to the Project or the Contract Documents or their breach, except for claims which have been waived by the making or acceptance of final payment, shall be submitted to mediation. The mediation will be conducted in accordance with the Construction Industry Dispute Resolution Procedures of the American Arbitration Association in effect on the date when the parties submit the matter to mediation, subject to the limitations of this paragraph.
 - 1. A demand for mediation of any claim, dispute or other matter that must be referred to Engineer pursuant to Paragraph 11.06 shall not be made until the earlier of:
 - (a) the date on which Engineer has rendered a decision, or
 - (b) the date on which the claimed is deemed denied due to no action having been taken by Engineer before that date.
 - 2. Any demand for mediation of a claim, dispute or other matter referred to the ENGINEER for decision pursuant to paragraph 11.06 must be made within the time limits stipulated in Paragraph 11.06.E. If Engineer renders a decision after mediation proceedings have been initiated, such decision may be entered as evidence but shall not supersede the mediation proceedings, except where the decision is acceptable to the parties concerned.
 - 3. Notice of the demand for mediation shall be filed in writing with the other party and with the American Arbitration Association and a copy shall be sent to Engineer for information. The initial case set-up fees for both parties shall be borne in the entirety by the requesting party. When the adverse party has received notice of the demand for mediation, the expenses of the mediation from that point shall be distributed and borne by the parties in accordance with the Construction Industry Dispute Resolution Procedures.
 - 4. A demand for mediation shall be made within the period specified in Paragraph 11.06, and in no event shall any such demand be made after the date when

institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.

5. No mediation arising out of or relating to the Project or the Contract Documents shall include by consolidation, joinder, or in any other manner, any other person or entity (including Engineer and Engineer's agents, employees or consultants) who is not a party to this Contract except by the written agreement of Owner, Contractor, and the other person(s), entity or entities to be included or joined.
 6. The Owner will select the location for any mediation conducted for this Project.
 7. The Contractor shall carry on the Work and maintain the progress schedule for the Project at all times during the resolution of any matters submitted to mediation.
 8. Any settlement agreement facilitated by the mediation will be final and binding, with documentation of the agreement being prepared by the mediator and executed by both parties at the close of the mediation. Any settlement agreement entered by the Owner and Contractor is subject to and may be enforced under the law of the jurisdiction where the Project is located.
- B. Should the Owner and Contractor be unable to agree to resolve a claim or dispute by mediation, both parties, by written agreement, may submit the claim, dispute or other matter to binding arbitration, which shall be conducted in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association in effect on the date when the parties submit the matter for arbitration, subject to the following limitations:
1. The location for the arbitration shall be the same political subdivision where the Project is located.
 2. The arbitration shall not include by consolidation, joinder, or in any other manner, any other person or entity (including Engineer and Engineer's agents, employees or consultants) who is not a party to this Contract except by the written agreement of the Owner, Contractor and the other person(s), entity or entities to be included or joined.
 3. The Contractor shall carry on the Work and maintain the progress schedule for the Project at all times during the resolution of the matters submitted to arbitration.
 4. The arbitration award will be written, final and binding, and signed by the majority of the arbitrators (if there are more than one), with certified copies to be delivered to each of the parties and to Engineer. Judgment may be rendered upon the award by the Federal Court or the highest State Court having appropriate jurisdiction over either of the parties.
- C. Should the Owner and Contractor be unable to agree to resolve a claim or dispute by mediation, and unable to agree to submit the claim or dispute to binding arbitration, both parties agree that the matter shall be litigated in the lowest level court of law of competent jurisdiction where the project is located and neither party will move for a change of venue to any other location. Should the project be incomplete at the onset of any litigation, the Contractor shall carry on the work and maintain the progress schedule during any court proceedings, unless otherwise mutually agreed in writing.

ARTICLE 18 – MISCELLANEOUS

A. SC 18.03.A Add the following new paragraph immediately after paragraph 18.03.A:

“B. Whenever reference is made to ‘claims, losses and damages,’ it shall include in each case, but not be limited to, all fees and charges of consultants to the OWNER, as well as attorneys, all court costs and other professionals concerned.”

B. SC 18.09 Add the following new paragraph after Paragraph 18.08:

Tribal Sovereignty. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the {insert name of Tribe} 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.

SC 19 ADD ARTICLE 19 TITLED “FEDERAL REQUIREMENTS”

A. SC 19.01 Add the following language as Paragraph 19.01 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.

B. SC 19.02 Add the following sections after Article 19.01 with the title “Contract Approval”:

A. Owner and Contractor will furnish Owner’s attorney such evidence as required so that the Owner’s attorney can complete and execute the following “Certificate of Owner’s Attorney” (Exhibit F) 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.

C. 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.

D. 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.

E. 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 Contractor 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.

F. SC 19.06 Add the following language after Article 19.05.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.

G. SC 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.

H. SC 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 is required. Contractor will report violations to the Agency and the Regional Office of the EPA.

I. SC 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.

J. SC 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.

K. SC 19.11 Add the following after Article 19.10.C with the title "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 U.S.C. 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.

L. SC 19.12 Add the following after Article 19.11.A with the title "Environmental Requirements":

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

- 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 (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.
- C. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact or human remains 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.

SECTION 00 91 13
ADDENDA

The following Addenda were issued during the bidding process for the Work, and are included herein as part of the Construction Documents. The Addenda are provided in reverse chronological order.

END OF SECTION 00 91 13

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Utilities Service
KENTUCKY BULLETIN 1780-2

SUBJECT: Guidance for Implementation of American Iron and Steel (AIS).

TO: Applicants, Consulting Engineers, Contractors, and Manufacturers

EFFECTIVE DATE: Date of approval.

INSTRUCTIONS: This Bulletin replaces the existing 2018 Kentucky Bulletin 1780-2.

AVAILABILITY: This Bulletin, as well as any RD or RUS instructions, regulations, or forms referenced in this Bulletin are available at any RD State Office or Area Office. The State Office staff is familiar with the use of the documents and can answer specific questions or RD requirements.

The basic concept of this new requirement is that all iron and steel products used in projects funded by RUS WEP must be produced in the United States. Iron and steel products are defined on page 14 of this Bulletin.

PURPOSE: This Bulletin provides information and guidance to effected parties regarding the AIS Requirements mandated by Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A-Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statues mandating domestic preference.

Julie Anderson
State Engineer
Water and Environmental Programs

11/19/2019

Date

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1. BACKGROUND

- A. Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statues mandating domestic preference. It applies a new American Iron and Steel (AIS) requirement on the Rural Development (RD) WEP program.
- B. Statutory Language: SEC 746 Division A Title VII the Consolidated Appropriations Act of 2017.
 - (1) No Federal funds made available for this fiscal year for the rural water, waste water, waste disposal, and solid waste management programs authorized by sections 306, 306A, 306C, 306D, and 310B of the Consolidated Farm and Rural Development Act (7 USC 1926 et seq.) shall be used for a project for the construction, alteration, maintenance, or repair of a public water or wastewater system unless all of the iron and steel products used in the project are produced in the United States.
 - (2) In this section, the term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipe flanges, manhole covers, and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

2. APPLICABILITY

- A. The requirements of AIS apply only to projects that construct, alter, enlarge, extend, maintain, repair or otherwise improve rural water, sanitary sewage, solid waste disposal, and storm wastewater disposal facilities.
- B. The requirements apply to projects using funds from RD WEP. Any amount of funding from this program requires compliance with the AIS requirements. Use of funds from this program is not allowed unless the requirements for AIS are met for the entire project. Projects that leverage funds from other funding sources are also subject to the requirements.
- C. The requirements apply in the United States as defined in Section 746 (g) of the statute and therefore do not apply to projects located in Puerto Rico, the Virgin Islands, or Western Pacific Territories.
- D. The requirements apply to any used iron and steel products to be constructed in the project.
- E. The requirements do not apply to projects for which any funds were obligated on or before May 5, 2017. The requirements therefore do not apply to subsequent obligation of funds for projects which had an initial obligation of funds on or before May 5, 2017.
- F. The requirements do not apply to contracts which were executed prior to or on May 5, 2017, regardless of date of obligation.

- G. The requirements do not apply to projects for which contracts were executed and/or construction is already underway and/or completed prior to applying to USDA for funding.
 - H. The requirements do not apply to products primarily composed of iron and/or steel (composed of more than 50%) if they are not listed in the statute.
 - I. The requirements do not apply to raw materials used in the production of iron or steel such as iron ore, limestone, scrap iron and scrap steel.
 - J. The requirements do not apply to any items that are at the construction site temporarily, such as scaffolding, trench boxes, and equipment temporarily used or stored on site.
 - K. The requirements do not apply when the sole purpose of the loan and/or grant is to fund non-construction activities such as capacity/connection fees or the acquisition of a system.
 - L. The requirements supersede any regulation on full and open competition stated in 7 CFR 1780.70 (b) and 2 CFR Part 200.319. For example, if an iron and steel product that is compliant with AIS is made by only one manufacturer, provided documentation is submitted and verified, sole source procurement of said product may be used.
 - M. The requirements only apply to the final product as delivered to the work site and incorporated into the project. The need for compliance of an item with AIS depends on whether or not the final assembled product is listed. Components of a final product, even if they are listed, do not need to comply with the AIS requirements. In the case of an assembled product where the primary component is not listed in the 2017 Consolidated Appropriations Act and includes components/appurtenances that are specifically listed, said assembled product is not subject to AIS (e.g. pump assembly).
 - N. The requirements do not apply to any material that falls under a national waiver. There are three approved national waivers (attached for reference). They are the De minimis and Minor Components Waiver, Pig Iron and Direct Reduced Iron, and Stainless Steel Nuts and Bolts. These items should still be listed on the AIS Materials Tracking sheet but under Manufacturer list which waiver applies. De minimis must still be calculated.
3. IMPLEMENTATION (Agency, Owner, Engineer, Contractor, manufacturer's et al)
- A. There are several parties involved in compliance with the AIS requirement and some requirements are specific to a party.
 - B. The parties that have one or more responsibilities under AIS include: the Agency funding recipients under the Water and Waste Disposal Loan and Grant program and Guaranteed Loan Program, consulting engineers, construction contractors, suppliers, distributors, manufacturers; lenders under the Guaranteed Loan Program; and grantees under 306C and ECWAG programs.

4. OWNER RESPONSIBILITIES:

- A. Sign loan resolutions, grant agreements and letters of intent to meet conditions which include AIS language, accepting AIS requirements in those documents and in the letter of conditions.
- B. Sign Agreement for Engineering Services, executed construction contracts and all other appropriate and necessary documents which include AIS language.
- C. Acknowledge responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial payment estimates (i.e. C-602 of EJCDC or RD Form 1924-18).
- D. Obtain the certification letters from the Engineer once substantial completion has been achieved and maintain this documentation for the life of the loan.
- E. In special cases where the Owner provides its' own engineering and/or construction services, provide copies of Engineer's Certification Letter (Attachment 2) and Contractor's Certification Letter (Attachment 3) to the Agency. Manufacturer's Certification Letter (Attachment 4) must be obtained by the Owner for each AIS qualifying product. All certification letters must be kept in the Engineer's project file and on site during construction. For Owner Construction (Force Account), all AIS clauses from Section 11 must be included in the Agreement for Engineering Services.

5. ENGINEER RESPONSIBILITIES

- A. Costs of compliance with AIS should be included in the engineering fees (if appropriate) and in Engineer's opinions of probable project costs.
- B. Include AIS language (Section 11) in the Agreement for Engineering Services.
- C. Plans, specifications, bidding documents and bid addenda must include required AIS language (Section 12). For any AIS products specified by brand names, obtain a Manufacturer's Certification Letter (Attachment 4) from the manufacturer to verify the products comply with AIS.
- D. Certify that plans, specifications, and bidding documents comply with AIS and commit that bid addenda, executed contracts and change orders will comply with AIS and submit Engineer's Certification Letter (Attachment 2) to the Agency ***prior to authorization to advertise for bids.*** Include a preliminary list of those items subject to AIS for bidding purposes (Attachment 10).
- E. Provide a copy of the Manufacturer's Certification Letter (Attachment 4) on any specified brand name AIS products in the plans, specifications and bidding documents including any bid addenda to the Contractor.

- F. After award of the contract, consult with the low bidder to finalize the preliminary list of AIS items and develop a comprehensive list of all AIS components to be used in construction and electronically submit to RD State Engineer. AIS Materials List (Attachment 10) should be used to set up the master list and must be updated and submitted with each pay request.
- G. Review shop drawings and change orders to ensure compliance with AIS. For shop drawings under consideration for any brand name, equal and/or substitute, any iron and steel products subject to AIS, obtain the Manufacturer's Certification Letter (Attachment 4) from the Contractor to verify the products comply with AIS.
- H. Keep all certification letters from the Engineer, Contractor, and any AIS material manufacturer in the Engineer's project file. Provide a copy of the manufacturer's certification to the RD Engineer with each pay request that includes that AIS item. The RD Engineer will perform site AIS compliance inspections during construction. A copy of all manufacturer's letters to date that have been submitted and reviewed by RD Engineer will be used to compare the delivered and installed materials (if possible).
- I. Review AIS Materials List (Attachment 10) submitted with each pay request to verify accuracy and sign and date.
- J. For any change order under consideration for any AIS products, obtain a Manufacturer's Certification Letter (Attachment 4) from party submitting the change proposal to ensure compliance with AIS.
- K. Acknowledge responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC or RD Form 1927-7) and partial pay estimates (i.e. C-620 of EJCDC or RD Form 1924-18).
- L. Upon substantial completion of project, obtain the Contractor's Certification Letter (Attachment 4) and a complete and final AIS Materials List (Attachment 10) to submit to the RD State Engineer. Obtain copies of any/all manufacturers' certification letters for all AIS products used in the project to be kept in the Owner's project file.
- M. Resident project representative (RPR) reports must include verification, either by picture or written statement, when an AIS item is delivered and when it is installed and was in compliance with requirements based on manufacturer's certification.

6. CONTRACTOR RESPONSIBILITIES

- A. Review the Engineer's AIS information, preliminary list of applicable AIS items, and all instructions prior to bid preparation.
- B. Bid submittal with a request for consideration from a proposed equal or substitute should also include a Manufacturer's Certification Letter (Attachment 4) to verify the products comply with AIS.
- C. Upon award of the contract, obtain copies of any and all manufacturers' certification letters from the Engineer for brand name products specified by the Engineer.

- D. Shop drawing submittals for proposed equals, substitutes, and any iron and steel product subject to AIS, provide a Manufacturer's Certification Letter (Attachment 4) to verify the product complies with AIS. Work with the Engineer to develop a final comprehensive list of all AIS applicable materials. AIS Materials List (Attachment 10) should be used to set up the master list and must be updated, signed, and submitted with each pay request throughout the project and accompanied by the applicable manufacturer's certification.
 - E. Prior to construction, ensure that copies of any and all manufacturers' certification letters, including those from others (e.g. Engineer, Owner, etc.), for any specified AIS products to be used in the project are in the project file on site prior to installation.
 - F. Pay request must have an updated AIS Materials List (Attachment 10) with manufacturers certification for items included on the pay request and submitted with each pay request. All columns must be filled out completely as applicable. Do not complete columns under "De Minimis Materials Only" for qualifying materials. Sign and date. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
 - G. Change orders for any AIS products must include a Manufacturer's Certification Letter (Attachment 4) to the Engineer to verify the products comply with AIS.
 - H. Acknowledge responsibility for compliance with AIS requirement by signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial pay estimates (C-620 of EJCDC or RD Form 1924-18).
 - I. Keep all manufacturer certification letters (including those from the Engineer and any manufacturer providing AIS products) on site during construction in the construction project file. If a construction item is required that does not appear to meet the AIS requirements, notify the project engineer as soon as possible and do not install the item until it has been resolved.
 - J. Upon substantial completion of the project, provide Contractor's Certification Letter (Attachment 3) to the Engineer that all iron and steel products installed comply with AIS
7. MANUFACTURER, SUPPLIER, DISTRIBUTOR RESPONSIBILITIES
- A. If iron and steel products are produced in the United States as defined in this Bulletin, prepare (applicable to manufacturers and fabricators) or obtain (applicable to suppliers, distributors, vendors, etc.) Manufacturer's Certification Letters (Attachment 4) and make available upon request to Engineer, Contractor, etc.
8. RESPONSIBILITIES UNDER THE GUARANTEED LOAN PROGRAM
AIS applies to projects funded by Section 306A- Guaranteed Loan Program
- A. Lenders are responsible to ensure that loan recipients comply with AIS requirements.
 - B. Loan recipients are ultimately responsible for compliance with AIS requirements.

9. ECWAG

- A. If construction contracts were awarded and/or executed or construction began prior to application, these projects are not subject to AIS (Section 2).
- B. If construction contracts were awarded and/or executed or construction began during the application process, these projects are subject to AIS.

10. AGREEMENT BETWEEN OWNER AND ENGINEER (EJCDC E-500) PROVISIONS

- A. Article 5.01.A: Add the following "Opinions of probable cost and any revisions thereof should reflect compliance with American Iron and Steel (AIS) requirements mandated in the Consolidated Appropriations Act of 2017 and any subsequent mandating domestic preferences."
- B. Add paragraph 5.03.B: "Opinions of total project cost and any revisions thereof should reflect compliance with AIS and any subsequent statutes mandating domestic preference."
- C. Add paragraph A.1.03.A.12: "Services required to determine and certify that to the best of the Engineer's knowledge and belief that all iron and steel products referenced in engineering analysis, the plans, specifications, bidding documents, and associated bid addenda requiring design revisions are either produced in the US or are subject to approved waiver. Services required to determine to the best of the Engineer's knowledge and belief that approved substitutes, equals, and all iron and steel products proposed in the shop drawings, change orders and partial payment estimates are either produced in the US, or are subject of an approved waiver. The de minimis waiver {add project specific waivers if applicable} applies to this contract."
- D. Add paragraph A.1.04.A.10: "Provide copies of all manufacturers' certification letters to the Bidders on brand name iron and steel products along with plans, specifications and bidding documents. Manufacturers' certification letters must on the Manufacturer's Certification Letter (Attachment 4) provided and be kept in the Engineer's project file and on site during construction."
- E. Add paragraph A.1.04.A.11: "Provide copies of all manufacturers' certification letters to the Contractor on any brand name iron and steel products upon award, Including any bid addenda and change orders. Manufacturers' certification letters must be kept in the Engineer's project file for the duration of construction."
- F. Add paragraph A.1.04.A.12: "Provide a preliminary list of those items subject to AIS requirements for bidding purposes and finalize with the Contractor for tracking and submit to RD. Review the contractors AIS Materials List (Attachment 10) for accuracy each month and include in each pay request with manufacturer's certification. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy."

- G. Modify A.1.05.A.17: Add the following prior to the first sentence "Review and approve, or take other appropriate action, with respect to shop drawings, samples, and other required Contractor submittals to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference. Any iron and steel products included in any submittal by the Contractor, must include the Manufacturer's Certification Letter (Attachment 4) to verify the products were produced in the U.S. Copies of these letters must be kept in the Engineer's project file and on site during construction."
- H. Article A.1.05.A.18: Add the following at the end of the paragraph as amended by Kentucky Bulletin 1780-1 "Prior to approval of any substitute "or equal" obtain the Manufacturer's Certification Letter (Attachment 4) to verify the products were produced in the U.S. Manufacturers' certification letters must be kept in Engineer's project file and on site during construction to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference, if applicable."
- I. Add subparagraph A.1.05.A.19.d: "Receive and review all manufacturers' certification letters for materials required to comply with AIS and any subsequent statutes mandating domestic preference to verify the products were procured in the U.S. Manufacturers' certification letters must be kept in the Engineer's project file on site during construction."
- J. Add subparagraph (c) to the end of A.1.05.A.20: (c) Review change proposals to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference."
- K. Add item "a" as a deliverable under paragraph A.1.05.A.24.b: (s) Obtain the Contractor's Certification Letter (Attachment 3) and copies of manufacturers' certification letters for all AIS used in the project. Upon substantial completion, provide copies of Engineer's, Contractor's, and all manufacturers' certification letters to the Owner. Attach Contractor's Certification Letter(Attachment 3) and a final AIS Materials List (Attachment 10) with letter of substantial completion and submit it to the Agency."
- L. Add subparagraph B.2.02: "Owners are ultimately responsible for compliance with AIS and any subsequent statutes mandating domestic preference and will be responsible for the following:
 - 1. Signing loan resolutions, grant agreements and letter of intent to meet conditions which include AIS language, accepting AIS requirements in those documents and in the letter of conditions.
 - 2. Signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial pay estimates (C-620 of EJCDC or RD Form 1924-18) and thereby acknowledging responsibility for compliance with AIS requirements.
 - 3. Obtaining all certification letters from the Engineer upon substantial completion of the project and maintaining this documentation for the life of the loan.

4. Where the Owner provides their own engineering and/or construction services, provide copies of Engineer's, and Contractor's certification letters to the Agency, and obtain all manufacturers' certification letters as required. All certification letters must be kept in the Engineer's project file and on-site during construction. For Owner Construction (Force Account), all clauses from Section 11 must be included in the Agreement or Engineering Services.
 5. Where the Owner directly procures AIS products, including AIS clauses in the procurement contracts and obtaining manufacturers' certification letters and providing copies to consulting engineers and contractors.
- M. Add subparagraph D.1.01.C.11.g: "(g) Maintain all manufacturers' certification letters in the project file and on site during construction to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference, as applicable."
- N. Add the following at the end of D.1.01.C.11b: Daily reports should document delivery and installation of an AIS material and verify by picture or statement on the report that the manufacturer was the same as that listed on the AIS materials list and complied with AIS requirements.
11. BIDDING AND CONSTRUCTION CONTRACT DOCUMENTS (EJCDC C-SERIES, 2013)
- A. Advertisement for Bids (C-111)

Add at the end of C-111 prior to the Owner's name: "Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies, Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies to American Iron and Steel requirement to this project. All listed iron and steel products used in this project must be produced in the United States. The term "iron and steel products" means the following products made primarily of iron and steel: lines or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. The de minimis waiver, pig iron and nuts and bolts all apply to this contract."
 - B. Instruction to Bidders (C-200)
 1. Article 5.01.C: Delete the semicolon at the end of the article and insert the following "included but not limited to the AIS requirements as mandated and any subsequent statutes mandating domestic preference which apply to the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.
 2. Article 11.01: Modify article as previously amended by Kentucky Bulletin 1780-1 by inserting the following sentence after "Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. Each such request shall include the Manufacturer's Certification Letter (Attachment 4) for compliance with AIS requirements and any subsequent statutes mandating domestic preference, if applicable.

3. Article 24.03: Add paragraph 24.03 :Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and any subsequent statues mandating domestic preference applies an American Iron and Steel requirement to this project. All iron and steel products used in this project must be procured in the United States. "Iron and Steel Products" is defined in Section 1.b.2. The de minimis waiver {add project specific waivers as applicable} applies to this contract."
- C. Bid Form (C-410)
1. Article 3.01.C: Add language at the end of the sentence "...and including all AIS requirements.
 2. Article 7.01: Add 7.01.K "Manufacturer's Certification Letter (Attachment 4) on any approved "or equal" or substitute request to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference.
- D. Supplementary General Conditions (C-800)
1. SC 1.01.A.51: "Manufacture's Certification Letter (Attachment 4) is documentation provided by the manufacturer, supplier, distributor, vendor, fabricator, etc. to various entities stating that the AIS products to be used in the project are produced in the U.S. in accordance with the AIS requirements.
 2. SC 1.01.A.52: "AIS refers to requirements mandated by Section 746 Title VII of the Consolidated Appropriation s Act of 2017 and any subsequent statutes mandating domestic preference. "Iron and Steel Products" is defined in Section 1.b.2.
 3. SC 7.03: Add sentence "all iron and steel must meet AIS requirements.
 4. SC 7.04.B.1: "Contractor shall include the Manufacturer's Certification Letter (Attachment 4) for compliance with AIS requirements to support data, if applicable. In addition, Contractor shall maintain an updated AIS Materials List (Attachment 10), to ensure that for de minimis waiver, cost is less than 5% of total materials cost for project." An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
 5. SC 7.05.A.3.a4: "4) comply with AIS by providing the Manufacturer's Certification Letter (Attachment 4), if applicable.
 6. SC 7.11.A: Modify by inserting the following after "written interpretations and clarifications, "; "Manufacturer's Certification Letter (Attachment 4) is documentation provided by the manufacturer, supplier, distributor, vendor, fabricator, etc. to various entities stating that the iron and steel products to be used in the project are produced in the U.S. in accordance with AIS requirements.
 7. SC 7.16.A.1.e: "e. obtain the Manufacturer's Certification Letter (Attachment 4) for any item in the submittal subject to AIS requirements and include the certificate in the submittal.
 8. SC 7.16.D.9: Add the following paragraph: "Engineer's review and approval of shop drawings or sample shall include review of compliance with AIS requirements, as applicable."

9. SC 7.17.E: "Contractor shall certify, upon substantial completion, that all work and materials have complied with AIS requirements as mandated and any subsequent statutes mandating domestic preference. Contractor shall provide Contractor's Certification Letter (Attachment 3) to Owner.
10. SC 10.10.A: "A: Services required to determine and certify that, to the best of the Engineer's knowledge and belief, all iron and steel products referenced in the engineering analysis, the plans, specifications, bidding documents, and associated bid addenda requiring design revisions are either produced in the U.S. or are the subject of an approved waiver. Services required to determine, to the best of the Engineer's knowledge and belief, that approved substitutes, equals, and all iron and steel products proposed in the shop drawings, change orders, and partial pay estimates are either produced in the U.S. or are the subject of an approved waiver under the Consolidate Appropriations Act of 2017.
11. SC 11.06.A.1: Modify by inserting the following sentence after "within 15 days after the submittal of the change proposal..." "Include supporting data (project name, name of manufacturer, city and state where the product was manufactured, description of product, signature of authorized manufacturer's representative) in the Manufacturer's Certification Letter (Attachment 4), as applicable."
12. SC 14.03G: Installation of materials that are non-compliant with AIS requirements shall be considered defective work.
13. SC 15.01.B.4: "4. By submitting materials for payment, Contractor is certifying that the submitted materials are compliant with AIS requirements. Manufacturers' Certification letter for Materials satisfy this certification. Refer to Manufacturer's Certification Letter provided in these Contract Documents.
15. SC 15.01.C.2d: "d. The materials presented for payment comply with AIS requirements.
14. SC 15.01.D.2: An updated AIS Materials List (Attachment 10) included in these contract documents must be dated and signed and submitted with each pay request prior to payment being authorized with any applicable manufacturer's certification. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
16. SC 15.03.A: Modify by adding the following "Services required to determine and certify that, to the best of the Contractor's knowledge and belief, all substitutes, equals, and iron and steel products proposed in the shop drawings, change orders, and partial payment estimates are produced in the U.S. or are the subject of an approved waiver. Services required to certify that, to the best of the Contractor's knowledge, all those products installed for the project are either produced in the U.S. or are the subject of an approved waiver."
17. SC19.14: Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and any subsequent statutes mandating domestic preference applies in AIS requirement to this project. All iron and steel products used in this project must be produced in the U.S. The term "iron and steel products" is defined in Section 1.b.2. The de minimis waiver, pig iron and nuts and bolts waivers apply to this contract."

18. SC 19.15: add Definitions:

"Assistance recipient" is the entity that received funding assistance from programs required to comply with AIS requirements in the Consolidated Appropriations Act of 2017 and any subsequent statutes mandating domestic preference. This term includes owner and/or applicant.

"Certifications" means the following:

- *Manufacturers'* certification is the documentation provided by the manufacturer or fabricator to various entities stating that the iron and steel products to be used in the project are produced in the U.S. in accordance with AIS requirements. If items are purchased via a supplier, distributor, vendor, etc. vs. direct from the manufacturer or fabricator directly, then the supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certification letters to the parties purchasing the product.
- *Engineer's* certification is documentation that plans, specifications, and bidding documents comply with AIS.
- *Contractors'* certification is documentation submitted upon substantial completion of the project that all iron and steel products installed were produced in the U.S.

"Coating" means a covering that is applied to the surface of an object. If a coating is applied to the external surface of a domestic iron or steel component, and the application takes place outside of the U.S., said product will be considered a compliant product under the AIS requirements. Any coating processes that are applied to the external surface of iron and steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the coating processes occur, provided that final assembly of the product occurs in the U.S. This exemption only applies to coatings on the *external surface* of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes, including the application of pipe lining, must occur in U.S. for the product to be compliant with AIS requirements.

"Contractor" is the individual or entity with which the applicant has contracted (or is expected to) to perform construction services (or for water and waste projects funded by the programs which are subject to AIS requirements). This includes bidders and/or contractors that have received an award from the applicant and any party having a direct contractual relationship with the owner/applicant. A general contractor is often referred to as the prime contractor.

"Construction materials" are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not included mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel".

Note: Mechanical and electrical components, equipment, and systems are not considered construction materials. See definition of mechanical and electrical equipment.

"De minimis incidental components" are various miscellaneous low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. Examples of incidental components could include small washers, screws, fasteners (such as "off the shelf" nuts and bolts, miscellaneous wire, corner bead, ancillary tube, signage, trash bins, door hardware etc.

Costs for de minimis incidental components cumulatively may comprise no more than a total of five percent of the total cost of the materials used in and incorporated into a project. The cost of an individual item may not exceed one percent of the total cost of the materials used in and incorporated into a project.

"Engineer" is an individual or entity with which the owner has contracted to perform engineering/architectural services for water and waste projects funded by the programs subject to AIS requirements.

"Iron and Steel Products" are defined as the following products made primarily of iron and steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. Only items on the above list made of primarily iron or steel, permanently incorporated into the project must be produced in the U.S. For example; trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

"Manufacturers" meaning supplier, fabricator, distributor, materialman, or vendor is an entity with which the applicant, general contractor or with any subcontractor has contracted to furnish materials or equipment to be incorporated in the project by the applicant, contractor or subcontractor.

"Manufacturing processes" are processes such as melting, refining, forming, rolling, drawing, finishing, and fabricating. Further, if a domestic iron and steel product is taken out of the U.S. for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone, and iron and steel scrap are not covered by the AIS requirements, and the material(s), if any, being applied as coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-U.S. sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-U.S. sources.

"Mechanical equipment" is typically that which has motorized parts and/or is powered by a motor. "Electrical equipment" is typically any machine powered by electricity and included components that are part of the electrical distribution system. AIS does not apply to mechanical equipment.

"Minor components" are components within an iron or steel product otherwise compliant with the AIS requirements. This is different from the de minimis definition where de minimis pertains to the entire project and the minor component definition pertains to a single product. This waiver would allow non-domestically produced miscellaneous minor components comprising up to five percent of the total material cost of an otherwise domestically produced iron and steel product to be used. However, unless a separate waiver for a product has been approved, all other iron and steel components in said product must still meet the AIS requirements. This waiver does not exempt the whole product from the AIS requirements. Only minor components within said product and the iron or steel components of the product must be produced domestically. Valves and hydrants are also subject to the cost ceiling requirements described here. Examples of minor components could include items such as pins and springs in valves/hydrants, bands/straps in couplings, and other low-cost items such as small fasteners etc.

"Municipal castings" are cast iron and steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and solid waste infrastructure.

"National Office" refers to the office responsible for the oversight and administration of the program nationally. The National Office sets policy, develops program regulations, and provides training and technical assistance to help the state offices administer the program. The National Office is located in Washington, D.C.

"Owner" is the individual or entity with which the general contractor has contracted regarding the work, and which has agreed to pay the general contractor for the performance of the work pursuant to the terms of the contract for water and waste projects funded by the programs subject to AIS requirement. For the purpose of this Bulletin, the term is synonymous with the term "applicant" as defined in 7 CFR 1780.7 (a) (1), (2), and (3), and is an entity receiving financial assistance from the programs subject to AIS requirements.

"Primarily iron or steel" is defined as a product made of greater than 50 percent iron or steel, measured by cost. The cost should be based on the material costs. An exception to this definition is reinforced precast concrete (see Definition). All technical specifications and applicable industry standards (e.g. NIST, NSF, AWWA) must be met. If a product is determined to be less than 50 percent iron and steel, the AIS requirements do not apply.

For example, the cost of a fire hydrant includes:

1. The cost of materials used for the iron portion of the fire hydrant (e.g. bonnet, body, and shoe); and
2. The cost to pour and cast and create those components (e.g. labor and energy).

Not included in the cost are:

1. The additional material costs for the non-iron and steel internal working of the hydrant (e.g. stem, coupling, valve, seals, etc.); and
2. The cost to assemble the internal workings into the hydrant body.

"Produced in the United States" means that the production in the United States of the iron or steel products used in the project requires that all manufacturing processes must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives.

"Project" is the total undertaking to be accomplished for the applicant by consulting engineers, general contractors, and others, including the planning, study, design, construction, testing, commissioning, and start-up of which the work to be performed under the contract is a part. A project includes all activity that an applicant is undertaking to be financed in whole or part by programs subject to AIS requirements. The intentional splitting of projects to separate into smaller contracts or obligations to avoid AIS requirements is prohibited.

"Reinforced Precast Concrete" may not consist of at least 50 percent iron or steel, but the reinforcing bar and wire must be produced in the United States and meet the same standards for any other iron or steel product. Additionally, the casting of the concrete product must take place in the United States. The cement and other raw materials used in concrete production are not required to be of domestic origin. If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the United States.

"Steel" means an alloy that includes at least 50 percent iron between 0.02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel, and other specialty steels.

"Structural steel" is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I beams, channels, angles, tees, and zees. Other shapes include but are not limited to, H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

"United States" means each of the several states, the District of Columbia, and each Federally Recognized Indian Tribe.

12. PURCHASE OF EQUIPMENT AND MATERIALS

Irrespective of who purchases AIS products, owner, contractor or other parties must ensure that the products were produced in the United States as defined in this Bulletin. It is the manufacturers' responsibility to provide manufacturers' certification letters to ensure compliance with AIS requirements. The AIS requirements supersede any regulation on full and open free competition stated in 7 CFR 1780.70(b) and (d) and 2 CFR Part 200.319. For example, if an iron and steel product that is compliant with AIS is made by only one manufacturer, sole source procurement of said product may be used.

13. WAIVER PROCESS

A. General

Each entity that receives financial assistance for the construction, alteration, maintenance, or repair of water and waste infrastructure from programs mandated to comply with the statute, must use iron and steel products produced in the United States. A waiver is a legal document granting a project an exception to AIS requirements, to use iron and steel products of non-domestic origin specified in the waiver(s). More than one waiver could be applied to a project.

Any funding recipient subject to AIS requirements are eligible to apply for waivers as outlined in the statute which states:

"A waiver may be granted by the Secretary of Agriculture or designee, if one or more of the following conditions are met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and Steel products are not produced in the United States in sufficient and reasonably available quantities or of satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the overall cost of the project by more than 25 percent."

Until a waiver is granted by USDA, the AIS requirement stands except with respect to municipalities covered by international agreements (see Section 17).

One public interest waiver has been granted by the Secretary of Agriculture or designee that addresses: (1) de minimis items and (2) minor components. This waiver is national in scope and applies to all projects. The term de minimis applies to products when they occur as a de minimis incidental components as intended for assistance recipients to use for their projects. The term minor components applies to minor components within an iron and/or steel product and is intended for manufacturers to certify that their products comply with AIS requirements. For definitions of de minimis and minor components see Definitions.

B. Application

To request a project specific waiver, proper and sufficient documentation must be provided by the assistance recipient (see Attachment 8).

To apply for a waiver under condition one (public interest), applicants and their consulting engineers must demonstrate definitive impacts on the community if a specified product is not utilized. Information must be submitted to the National Office (via EESEngineering@wdc.usda.gov), copy to the RD State Engineer and approved by the Administrator of RUS. Public interest waivers national in scope will be identified and approved by the Administrator of RUS.

To apply for a waiver under special condition two (quality or quantity), applicants and their consulting engineers must submit information outlined in Attachment 9 and 10 to the National Office (via EESEngineering@wdc.usda.gov).

All waiver applications must be submitted to National Office. If RD State Office receives any waiver requests, the request must be submitted to National Office for approval.

C. Timing

Waivers should be submitted prior to and no later than the submission of final plans, specifications, and bidding documents for any iron and steel products of known foreign origin. All waiver requests must be approved by the Agency prior to authorization to advertise for bids. In the event that a waiver is requested during construction such as via change order, it must be approved by the Agency prior to installation.

D. Evaluation by USDA

After receiving an application for a waiver of the AIS requirements, USDA National Office will publish the request on its website for 15 days and receive informal comment. National Office will evaluate whether the application adequately documents the statutory basis cited for the waiver. The Secretary or designee will determine whether or not to grant the waiver. Approved and disapproved waivers will be posted on the USDA AIS website. For project specific waivers where EPA and USDA are co-funding and the applicant has already submitted a request to and received an approval waiver from EPA, USDA will review said waiver for the co-funded project. Applicants/owners or their representatives are required to submit approved waiver to EESEngineerig@wdc.usda.gov for USDA RD review and concurrence.

All approved waivers must be included in the bidding documents, any bid addenda, change orders, and partial estimates. All information presented in waiver requests are subject to verification. Waiver requests deliberately containing false information will be rejected.

14. MONITORING

In order to comply with the Executive Order 13788 "Buy American, Hire American", dated April 18, 2017, and AIS requirements, monitoring activities will be completed by the State Office and/or National Office.

15. NON-COMPLIANCE

No Federal funds made available for the rural water, waste water, waste disposal, and solid waste management programs authorized by sections 306, 306A, 306C, 306D, 306E, and 310B of the Consolidated Farm and Rural Development Act (7 U.S.C. 1926 et seq.) shall be used for a project for the construction, alteration, maintenance, or repair of a public utility system unless all of the iron and steel products used in the project are produced in the United States.

Noncompliance occurs when funds are used from these programs for construction, alteration, maintenance, or repair using non-domestic iron or steel products and the product is not covered by either a project-specific or a national waiver. Loan and grant recipients should always avoid non-compliance as it is a violation of a Federal statute.

Process for Noncompliance

- (1) Identify the noncompliant product.
- (2) The loan or grant recipient notifies appropriate USDA RD State or National Office contact.
- (3) If USDA RD State Office is notified, the Program Director will notify the National Office, Director of EES.
- (4) USDA will apply remedies for noncompliance as per 2 CFR 200 338-342.

16. INTERNATIONAL AGREEMENTS

The AIS requirements apply in a manner consistent with United States obligations under international agreements. In a few cases where such an agreement exists between a loan and/or grant recipient and an international entity, the recipient is under the obligation to determine the applicability of the AIS requirements and document the actions taken to comply with these requirements.

17. USE OF ATTACHMENTS

The following explains the purpose of each Attachment to this Bulletin:

1. AMERICAN IRON AND STEEL: Attachment 1 is to be read by the RD Specialist at the pre-construction and signed by all parties' subject to the AIS requirements on the project. Signature of this form will serve as certification of advisement and acknowledgement of the AIS requirements.
2. ENGINEER'S CERTIFICATION OF COMPLIANCE: Attachment 2 consists of a letter to be completed and signed by the consulting engineer certifying that he/she will ensure that plans,

specifications, bidding documents, and associated bid addenda, executed contracts and change orders for this project will comply with the AIS requirements. This certification letter is to be submitted to the Agency for approval **prior** to the Advertisement for Bids and must be kept in the engineer's project file and on-site during construction.

3. GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE
Attachment 3 consists of a letter to be completed and signed by the general contractor certifying that he/she will ensure that all iron and steel products installed for this project, comply with the AIS requirements. This includes not only installation and/or construction by their own company, but any and all subcontractors and manufacturers their company has contracted with on this project. This certification letter is to be submitted upon substantial completion of the project to the project engineer.
4. REQUIRED MANUFACTURER'S CERTIFICATION LETTER OF COMPLIANCE: Attachment 4 is the certification letter to be completed and signed by the manufacturer certifying that he/she will ensure that all iron and steel products and/or materials shipped or provided for the subject project are in full compliance with the AIS requirements. This includes listing each individual item/product/material provided to the project and providing the location of this/these item(s) being manufactured, including assembly. All manufacturers' certification letters must be in this format or the format EPA provides and kept in the engineer's project file and on site during construction.
5. EXAMPLES OF MUNICIPAL CASTINGS: Attachment 5 provides a sample list of iron and steel products that are subject to the AIS requirements. This list is not exhaustive and is meant only to provide examples. A unique list should be completed for each specific project/contract.
6. EXAMPLES OF CONSTRUCTION MATERIALS: Attachment 6 provides a sample list of construction materials that are subject to the AIS requirements. This list is not exhaustive and is meant only to provide examples.
7. EXAMPLES OF NON-CONSTRUCTION MATERIALS: Attachment 7 provides a sample list of items that are not subject to AIS requirements. This list is not exhaustive and is meant only to provide examples.
8. INFORMATIONAL CHECKLIST FOR PROJECT SPECIFIC WAIVER REQUEST: Attachment 8 is a checklist that is to be completed by the applicant and/or consulting engineer to help ensure that all appropriate and necessary information is submitted with the request to USDA. This checklist should not be used for public interest waiver. It is for informational purposes only and does not need to be included as part of the waiver application. Project specific waivers may be requested if one or more of the following conditions applies: (1) The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of satisfactory quality; (2) The inclusion of iron and/or steel products produced in the United States will increase the overall cost of the project by more than 25 percent. All approved waivers must be included in the bidding documents, any bid addenda, change orders, and partial estimates. All information presented in waiver requests are subject to evaluation. Waiver requests deliberately containing false information will be rejected.

9. **EXAMPLE COST TABLE FOR A PROJECT COST WAIVER:** Attachment 9 is an example of a table that must be included with any cost-based project waiver request. Information included in the table; product reference in the specification, brief description of the product, quantity, unit, unit price and two costs of the item: (1) cost of an AIS compliant product and (2) cost of a non-domestic product. The total cost for all items will be part of the evaluation. Waiver requests deliberately containing false information in order to receive a project cost waiver will be rejected.

10. **AIS MATERIALS TRACKING:** Attachment 10 is a spreadsheet to track all AIS products, de minimis components. An updated list must be signed and dated and submitted to the Engineer by the Contractor with each pay request unless no qualifying AIS materials have been delivered on the pay request (a statement to that effect must be included on the pay request). Once reviewed for accuracy, the signed and updated list must be submitted to the Agency with each pay request. If an AIS qualifying or de minimis material is delivered more than once, a new line will be required for each delivery of that material. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.

Total cost of all materials as specified in the bid tab is required to be provided on the AIS tracking sheet to calculate the De Minimis amount allowable. It can be difficult to estimate the total cost of materials that will be used throughout the entire construction project to set up the spreadsheet. With this in mind, using 50% of the total construction cost as the amount used for material costs has proven to be a fairly accurate estimate and can be used on the AIS materials tracking sheet.

AMERICAN IRON AND STEEL COMPLIANCE STATEMENT

"Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statues mandating domestic preference applies an American Iron and Steel requirement to this project.

All parties are required to comply with these requirements and to ensure that all iron and steel products used on this project are produced in the United States. The term "iron and steel products" means the following products made of primarily iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials."

RD Representative Signature

Date

Printed Name

Borrower Signature or Approved Representative

Date

Printed Name

Engineer's Signature

Date

Printed Name

Contractor's Signature

Date

Printed Name

ENGINEER'S CERTIFICATION LETTER

DATE:

RE: APPLICANT
PROJECT NAME
CONTRACT NUMBER

I hereby certify that to the best of my knowledge and belief, iron and steel products referenced in the Plans, Specifications, and Bidding Documents for this project comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 and any subsequent statutes mandating domestic preference or are the subject of a waiver approved by the Secretary of Agriculture or designee. This certification is not intended to be a warranty in any way, but rather the designer's professional opinion that to the best of their knowledge, the products comply.

I hereby commit that to the best of my ability, all iron and steel products that will be referenced in the Bid Addenda, Executed Contracts, and Change Orders will comply with Section 746 of the Title VII of the Consolidated Appropriations Act, 2017 and any subsequent statutes mandating domestic preference or are/will be the subject of a waiver approved by the Secretary of Agriculture or designee.

Name of Engineering Firm (Print)

By Authorized Representative (Signature)

Printed Name

Title

This document is to be submitted prior to Agency authorization for Advertisement for Bids.

CONTRACTOR'S CERTIFICATION LETTER

DATE:

**RE: APPLICANT
PROJECT NAME
CONTRACT NUMBER**

I hereby certify that, to the best of my knowledge and belief, all iron and steel products installed for this project by my company and by any and all subcontractors and manufacturers my company has contracted with for this project, comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 and any subsequent statutes mandating domestic preference or are the subject of a waiver approved by the Secretary of Agriculture or designee.

Name of Construction Company (Print)

By Authorized Representative (Signature)

Title

This certification is to be submitted upon completion of the project to the project engineer.

**REQUIRED FORMAT AND WORDING FOR
MANUFACTURER'S CERTIFICATION LETTER**

Date:

Company Name:

Company Address:

Subject: AIS Step Certification for Project (X), Owner's Name, and Contract Number

I, (company representative), certify that the (melting, bending, galvanizing, cutting, etc.) processes for (manufacturing or fabricating) the following products and/or material shipped or provided for the subject project is in full compliance with the mandated AIS requirements.

Item, Products and/or Materials, and location of delivery (City, State)

- 1.
- 2.
- 3.

Such process for AIS took place in the following location:

City, State

This certification is to be submitted upon request to interested parties (e.g. municipalities, consulting engineers, general contractors, etc.)

If any of the above compliance statements change while providing materials to this project, please immediately notify the person(s) who is requesting to use your product(s).

Authorized Company Representative

(Note: Authorized signature shall be manufacturer's representative and not the materials distributor or supplier)

EXAMPLES OF MUNICIPAL CASTINGS (*includes but not limited to*):

Access Hatches
Ballast Screen
Benches (Iron or Steel)
Bollards
Cast Bases
Cast Iron Hinged Hatches, Square and Rectangular
Cast Iron Riser Rings
Catch Basin Inlet
Cleanout/Monument Boxes
Construction Covers and Frames
Curb Corner Guards
Curb Openings
Detectable Warning Plates
Downspout Shoes (Boot, Inlet)
Drainage Grates, Frames and Curb Inlets
Inlets
Junction Boxes
Lampposts
Manhole Covers, Rings and Frames, Risers
Meter Boxes
Service Boxes
Steel Hinged Hatches, Square and Rectangular
Steel Riser Rings
Trash Receptacles
Tree Grates
Tree Guards
Trench Grates
Valve Boxes, Covers and Risers

EXAMPLES OF CONSTRUCTION MATERIALS (included but not limited to)

Wire rod, bar, angles
Concrete reinforcing bar, wire, wire cloth
Wire rope and cables
Tubing
Framing
Joists
Trusses
Fasteners (i.e., nuts and bolts)
Welding rods
Decking
Grating
Railings
Stairs
Access ramps
Fire escapes
Ladders
Wall panels
Dome structures
Roofing
Ductwork
Surface drains
Cable hanging systems
Manhole steps
Fencing and fence tubing
Guardrails
Doors
Stationary screens

EXAMPLES OF NON-CONSTRUCTION MATERIALS- (includes but not limited to):

(Note: includes appurtenances necessary for their intended use and operation and are not subject to AIS requirements)

Pumps
Motors
Gear Reducers
Drives (including variable frequency drives (VFD's))
Electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators).
Mixers
Gates (e.g. sluice and slide gates)
Motorized screens (such as traveling screens)
Blowers/aeration equipment
Compressors
Meters (flow and water meters)
Sensors
Controls and switches
Supervisory control data acquisition (SCADA)
Membrane filtration systems (includes RO package plants)
Filters
Clarifier arms and clarifier mechanisms
Rakes
Grinders
Disinfection systems
Presses (including belt presses)
Conveyors
Cranes
HVAC (excluding network)
Water heaters
Heat exchangers
Generators
Cabinetry and housing (such as electrical boxes/enclosures)
Lighting fixtures
Electrical conduit
Emergency life systems
Metal office furniture
Shelving
Laboratory equipment
Analytical instrumentation
Dewatering equipment

INFORMATIONAL CHECKLIST FOR PROJECT SPECIFIC WAIVER REQUEST

Please reference the specifications of the product.

Information	<input type="checkbox"/>	Note
<p>General</p> <ul style="list-style-type: none"> • Waiver request includes the following information: <ul style="list-style-type: none"> – Description of the foreign and domestic construction materials – Unit of measure – Quantity – Price – Date that product is needed (e.g. time of delivery or availability) – Location of the construction project – Name and address of the proposed supplier – A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime 		
<p>Cost Waiver Requests</p> <ul style="list-style-type: none"> • Waiver request includes the following information: <ul style="list-style-type: none"> – Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products (Exhibit J) – Relevant excerpts from the bid documents used by the contractors to complete the comparison – Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers 		
<p>Availability Waiver Requests</p> <ul style="list-style-type: none"> • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: <ul style="list-style-type: none"> – Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials – Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. – Date that product is needed (e.g. time of delivery or availability) to provide justification – Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects? 		

DIVISION 1: GENERAL REQUIREMENTS

**SECTION 01 11 00
SUMMARY OF WORK**

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The following major Work items are included in the Contract:

Improvements at three locations within the Owner's system: 1. Pirtle Spring Water Treatment Plant to Filter No. 4 to place the existing filter bay in operation, and improvements the exterior walkway over the clarifiers.; 2. Gray Lane Pump Station to increase capacity by replacing the existing groundwater well, pump, controls, equipment, structure, and site improvements. 3. Replace the existing control valve vault with the new Brizendine Booster Pump Station with new vault, pumps, controls, equipment, and site improvements. The Work includes all demolition, grading, temporary facilities, electrical services, equipment, structures, site improvements, SCADA integration, and miscellaneous appurtenances for a complete installation at each location. The work shall be completed in strict accordance with the drawings and the Contract Documents.

- B. The Contractor shall provide all materials, labor and equipment necessary for completion of the Project, including installation and testing prior to transfer to the District. The Contract Documents are intended to provide the basis for proper completion of the work suitable for the intended use of HCWD1. Anything not expressly set forth but which is reasonably implied or necessary for proper performance of the Project shall be included.

- B. The Contractor shall maintain the existing system in continuous operations. The Contractor shall not operate District hydrants or valves, but shall coordinate with the District when this is required.

1.02 PERMITS

The Contractor shall obtain any permits related to or required by, the Work in this Contract. HCWD1 has obtained the following permit(s) for this Project:

1. Kentucky Division of Water Construction Permit

1.03 CODES

Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices, citations and similar communications, to the HCWD1.

1.04 EXISTING CONDITIONS AND DIMENSIONS

- A. The Work in this Contract will primarily be performed in or around existing facilities of which a portion must remain functional, unless otherwise noted on the Drawings. The Contractor must maintain the required items and/or systems functional without additional effort by the Owner's personnel and at no extra costs to the Owner.

- B. The Contractor is responsible for verifying all existing conditions, elevations, benchmarks, and survey data, dimensions, etc., and providing his finished work to facilitate existing conditions.

1.05 EASEMENTS

- A. Owner has obtained permanent utility easement and/or temporary construction easement for the following properties, and executed exhibits are attached as a Supplement to the end of this section:
1. Hager Farms, Inc.; Salt River Road, Parcel #078-00-00-009.

END OF SECTION 01 11 00

SECTION 01 20 10
MEASUREMENT AND PAYMENT (LUMP SUM BID PROJECTS)

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. **Gray Lane Pump Station:** The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES demolition of existing station, boring and installation of well casing, concrete pad for platform, platform with canopy, pump, piping, testing, instruments, electrical controls, electrical service, fencing, SCADA integration, and associated grading and erosion controls.
- B. **Brizendine Pump Station:** The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES demolition of existing control valve vault, salvage of existing equipment, pump, vault, piping, testing, electrical controls, fencing, SCADA integration, and associated grading and erosion controls.
- C. **Pirtle Spring Water Treatment Plant – Filter No. 4:** The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES filter underdrain, waste water troughs, filter media, air piping, instrumentation, SCADA integration, cleaning and disinfection.
- D. **Pirtle Spring Water Treatment Plant – Clarifier Steps:** The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price. Lump sum price INCLUDES salvage of existing equipment, and electrical components; demolition of existing stairs and walkway; installation of new aluminum stairs and walkway, and reinstallation of removed equipment and electrical components.

1.02 PERIODIC ESTIMATE FORMS

- A. The Contractor shall prepare and submit a periodic estimate on the form provided by the Engineer. The estimate form will depict the Contractor's cost for completing the Contract requirements and show by major unit of the project work the Contractor's dollar value for the material and the labor (two separate amounts) to be used as a basis for the periodic payments. The Contractor's periodic estimate breakdown must be approved by HCWD1 before any payments will be made on this Contract.

The following items will be included in the breakdown for all lump sum projects:

- 1. **Mobilization:** Payment for the Contractor's mobilization shall include all costs incurred for moving equipment onto the project area and any pertinent costs related thereto.
- 2. **Bonds and Insurance:** Payment for bonds and insurance shall include the costs of the Performance and Payment Bonds provided under the Contract, and the premiums for insurance required under the Contract.

3. General Requirements: Payment for General Conditions will be distributed over the initial term of the Contract and shall include field supervision and support staff, office supervision and support staff, costs associated with maintaining the field operation, and other items required by the general requirements and conditions of the Contract.
4. Demobilization: Payment for the Contractor's demobilization upon completion of the Project shall include all costs incurred for removing equipment and materials from the Project area and any pertinent costs related thereto.

END OF SECTION 01 20 10

SECTION 01 25 00 SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section.

Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from **ICC-ES**.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within **seven** days of receipt of a request for substitution. Engineer will notify Contractor **through Construction Manager** of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **15** days prior to time required for preparation and review of related submittals.
1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided **for achieving LEED prerequisites and credits.**
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Engineer will consider requests for substitution if received within **30** days after **the Notice to Proceed**. Requests received after that time may be considered or rejected at discretion of Engineer.
1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
 - e. Substitution request is fully documented and properly submitted.
 - f. Requested substitution will not adversely affect Contractor's construction schedule.

- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 PROPOSAL REQUESTS

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

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Engineer.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor on from in Section 01 26 00.10 "Change Order".
- B. All Change Orders shall be sequentially numbered and dated.
- C. Change Order will fully describe all modifications to the Contract and will refer to the initiating Change Order Request, and will be fully executed by Owner, Engineer, and Contractor.
- D. Change Orders will be submitted to Contractor in triplicate. Contractor will sign and return two copies to Engineer.
- E. The schedule of Work shall be updated by Contractor to reflect all Change Orders and Field Orders.
- F. Upon completion of work under a Field Order, or Change Order, all pertinent changes to the Work will be shown on the Record Set by Contractor.
- G. Contractor shall not bill for a Change Order on the Application for Payment prior to its execution by the Owner. Engineer will not approve the portion of an Application for Payment which bills for a Change Order not yet executed by Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

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: _____

**SECTION 01 29 00
PAYMENT PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Engineer at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:

- a. Project name and location.
 - b. Name of Engineer.
 - c. Engineer's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
- a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of ten (10) percent of the Contract Sum.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
- a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Engineer by the last day of the month. The period covered by each Application for Payment is one month, ending on the last Saturday of each month.
- D. Application for Payment Forms: Use form in Division 00 “Application for Payment Form” or substitute form approved by Owner and Agency.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

- G. Transmittal: Submit five (5) signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. Copies of building permits.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Initial progress report.
 10. Report of preconstruction conference.
 11. Certificates of insurance and insurance policies.
 12. Performance and payment bonds.
 13. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 13 COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall coordinate the Work of all crafts, trades and subcontractors engaged on the Work, and he shall have final responsibility in regards to 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 execution of subcontract agreements and the assignment of the parts of the Work. Each craft, trade and subcontractor shall be made responsible to the Contractor, for furnishing embedded items, giving directions for doing all cutting and fitting, 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 actions 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 HCWD1.
- 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 to the end that complete coordination between the trades will be affected. Each subcontractor shall consult with the Contractor, who shall advise the Engineer if conflicts exist on the Drawings.
- E. Coordination shall include giving notice to HCWD1. Forty-eight (48) hours notice is required to adjust work schedules.
- F. Coordination includes local EMS (traffic) and appropriate road departments.

END OF SECTION 01 31 13

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

- B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 45 00 "Quality Control" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Three (3) paper copies.

- B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at weekly intervals.
- G. Material Location Reports: Submit at monthly intervals.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.
- I. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 2. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.

3. Testing Time: Include no fewer than 15 days for testing.
 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
 5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Limitations of continued occupancies.
 - b. Uninterruptible services.
 - c. Use of premises restrictions.
 - d. Provisions for future construction.
 - e. Seasonal variations.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within thirty (30) days of date established for the Notice to

Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.

- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in ten (10) percent increments within time bar.

2.3 REPORTS

- A. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
 - 1. Material stored prior to previous report and remaining in storage.
 - 2. Material stored prior to previous report and since removed from storage and installed.
 - 3. Material stored following previous report and remaining in storage.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
1. Preconstruction photographs.
 2. Periodic construction photographs.
 3. Final completion construction photographs.
- B. Related Requirements:
1. Section 01 33 00 "Submittals" for submitting photographic documentation.
 2. Section 01 77 00 "Project Closeout" for submitting photographic documentation as project record documents at Project closeout.
 3. Division 31 "Site Clearing" for photographic documentation before site clearing operations commences.

1.3 INFORMATIONAL SUBMITTALS

- A. Digital Photographs: Submit image files within thirty (30) days of taking photographs.
1. Digital Camera: Minimum sensor resolution of eight (8) megapixels.
 2. Format: Minimum 3200 x 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph.
 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of eight (8) megapixels, and at an image resolution of not less than 3200 x 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Engineer.
- C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Engineer.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take twenty (20) photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take twenty (20) photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take twenty (20) photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Final Completion Construction Photographs: Take twenty (20) color photographs after date of Substantial Completion for submission as project record documents. Engineer will inform photographer of desired vantage points.

END OF SECTION 01 32 33

SECTION 01 33 00 SUBMITTALS

PART 1 - GENERAL

1.01 WORK INCLUDED

Shop drawings, descriptive literature, project data and samples (when samples are specifically requested) for all manufactured or fabricated items shall be submitted by the Contractor to the Engineer for examination and review in the form and in the manner required by the Engineer. All submittals shall be furnished in at least three (3) copies to be retained by the Engineer and shall be checked and reviewed by the Contractor before submission to the Engineer. The review of the submittal 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 submittal 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. Materials or equipment for which submittals are required should not be ordered until submittals have been reviewed and approved. Ordering materials and equipment beforehand are at the Contractor's risk.

1.02 DEFINITIONS

The term "submittals" shall mean shop drawings, manufacturer's drawings, catalog sheets, brochures, descriptive literature, diagrams, schedules, calculations, material lists, performance charts, test reports, office and field samples, and items of similar nature which are normally submitted for the Engineer's review for conformance with the design concept and compliance with the Contract Documents.

1.04 CONTRACTOR'S ULTIMATE RESPONSIBILITY

Review by the Engineer of shop drawings or submittals of material and equipment shall not relieve the Contractor from the responsibilities of furnishing same of proper dimension, size, quantity, materials and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Review shall not relieve the Contractor from responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Review of shop drawings shall not be construed as releasing the Contractor from the responsibility of complying with the Specifications.

1.05 GENERAL REQUIREMENTS FOR SUBMITTALS

- A. 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 three (3) which will be retained by the Engineer and HCWD1. In lieu of three (3) hard copies, the Contractor may submit an electronic copy (pdf) to Engineer. Shop drawings shall be folded to an approximate size of 8-1/2 inch x 11 inch and in such manner that the title block will be located in the lower righthand 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. The Contractor shall review and check submittals, and indicate his review by initials and date.
- E. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer, in letter of transmittal of the deviation and the reasons therefore. All changes shall be clearly marked on the submittal with a bold mark other than red. Any additional costs for modifications shall be borne by the Contractor.
- F. 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 HCWD1, 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.
- G. 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.
- H. Submittals for all electrically operated items (including instrumentation and controls) shall include complete wiring diagrams showing lead, runs, number of wires, wire size, color coding, all terminations and connections, and coordination with related equipment.
- I. 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.
- J. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.
- K. Where manufacturer's 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.
- L. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.
- M. All bulletins, brochures, instructions, parts lists, and warranties packaged with and accompanying materials and products delivered to and installed in the Project shall be saved and transmitted to HCWD1 through the Engineer.

1.06 CONTRACTOR RESPONSIBILITIES

- A. Verify field measurements, benchmarks, field construction criteria, catalog numbers and similar data and coordinate each submittal with requirements of Work and 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 required submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

END OF SECTION 01 33 00

SECTION 01 42 00
REFERENCES AND ABBREVIATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: The date of the standard is that in effect as of the Bid date, unless a certain date is indicated for the standard in the Contract Documents.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. When required by an individual Specification section, the Prime Contractor shall obtain a copy of the standard. Maintain the copy at the job site, available for review by HCWD1, Engineer, Resident Representative and other appropriate parties until Substantial Completion.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
ACI	American Concrete Institute (Formerly: ACI International) www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
ANS	American National Standard	
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989

ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASME	ASME International (American Society of Mechanical Engineers) www.asme.org	(800) 843-2763 (973) 882-1170
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWG	American or Brown and Sharpe Wire Gage	
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(404) 622-0073
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(800) 328-6306 (847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
ECA	Electronic Components Association www.ec-central.org	(703) 907-8024
HI	Hydraulic Institute www.pumps.org	(973) 267-9700
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (202) 370-1800
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11

IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IPS	Iron Pipe Size	
ISO	International Organization for Standardization www.iso.org	41 22 749 01 11
MSHA	Mine Safety and Health Administration http://www.msha.gov/	(202) 693-9401
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NBS	National Bureau of Standards	
NEC	National Electric Code; latest edition	
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFPA	NFPA International (See NFPA)	
NPT	National Pipe Thread	
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSPE	National Society of Professional Engineers www.nspe.org	(703) 684-2800
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	

STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
UBC	Uniform Building Code (See ICC)	
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
125-lb. ANS; 250 lb. ANS	American National Standard for Cast-Iron Pipe Flanges and Flanged Fittings, Designation B16.1-1975, for the appropriate class	

B. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce National Institute of Standards and Technology www.nist.gov	(301) 975-4040
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-2664
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FG	Federal Government Publications www.gpo.gov	(202) 512-1800
GSA	General Services Administration www.gsa.gov	(800) 488-3111 (202) 619-8925
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112

LBL	Lawrence Berkeley National Laboratory Environmental Energy Technologies Division http://eetd.lbl.gov	(510) 486-4000
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742
SD	Department of State www.state.gov	(202) 647-4000
TRB	Transportation Research Board National Cooperative Highway Research Program www.trb.org	(202) 334-2934
USDA	Department of Agriculture Agriculture Research Service U.S. Salinity Laboratory www.ars.usda.gov	(202) 720-3656
USDA	Department of Agriculture Rural Utilities Service www.usda.gov	(202) 720-2791
USDJ	Department of Justice Office of Justice Programs National Institute of Justice www.ojp.usdoj.gov	(202) 307-0703
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772 (301) 881-0666
USPS	United States Postal Service www.usps.com	(202) 268-2000

C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CFR	Code of Federal Regulations Available from Government Printing Office www.gpo.gov/fdsys	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus	

(See FS)

FED-STD Federal Standard
(See FS)

FS Federal Specification (215) 697-2664
Available from Department of Defense Single Stock Point
<http://dodssp.daps.dla.mil>

Available from Defense Standardization Program
www.dsp.dla.mil

Available from General Services Administration (800) 488-3111
www.gsa.gov (202) 619-8925

Available from National Institute of Building Sciences/Whole (202) 289-7800
Building Design Guide
www.wbdg.org/ccb

MILSPEC Military Specification and Standards
(See DOD)

USAB United States Access Board (800) 872-2253
www.access-board.gov (202) 272-0080

USATBCB U.S. Architectural & Transportation Barriers Compliance Board
(See USAB)

D. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DEP Department for Environmental Protection (502) 564-2380

DOW Division of Water
<http://water.ky.gov/Pages/default.aspx>

KYTC Kentucky Transportation Cabinet (270) 766-5066
District 4 Office
<http://transportation.ky.gov/Pages/default.aspx>

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 45 00 QUALITY CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- 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 to that specified. All workmanship shall be first-class and shall be performed by mechanics skilled at, and regularly employed in, their respective trades.
- D. The Contractor shall determine that the equipment he proposes to furnish can be brought into the facility and installed in the space available. Equipment shall be installed so that all parts are readily accessible for inspection and maintenance.

1.02 WORKMANSHIP

Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

1.03 MANUFACTURERS' INSTRUCTIONS

Comply with manufacturers' instructions in full detail as to shipping, handling, storing, installing, start-up and operation.

1.05 TESTING SERVICES

- A. Tests, inspections and certifications of materials, of equipment, of subcontractors' work, or of completed work shall be provided by the Contractor, as required by the various sections of the Specifications, and all costs for such tests, inspections and certifications shall be included in the Contract Price. Testing services are considered incidental to the installation of the Project. Tests shall include, but not be limited to, hydrostatic pressure, chlorine disinfecting, bacteriological, low pressure air, deflection (mandrel), vacuum, exfiltration, CCTV inspection, concrete compression strength, soil density, and compaction.
- B. The Contractor shall submit the name of testing laboratory proposed for use on the Project to HCWD1, for approval.
- C. The Contractor shall deliver written notice to the Engineer at least two (2) work days in advance of any inspections or tests to be made at the Project site. All inspections or tests to be conducted in the field shall be done in the presence of HCWD1 or his representative.

- D. Certifications by independent testing laboratories may be by properly attested copies of the data including scientific procedures and results of tests.

END OF SECTION 01 45 00

SECTION 01 50 00
TEMPORARY CONTROLS AND UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Dust control.
- B. Erosion and sediment control.
- C. Temporary Electricity

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DUST CONTROL

- A. Execute work by methods to minimize raising dust from construction operations.
- B. Provide positive means to minimize construction or traffic generated dust from dispersing into atmosphere.
- C. Provide spraying of construction traffic areas with water to hold dust leaving the construction site to the minimum amounts allowed by regulations.

3.02 EROSION AND SEDIMENT CONTROL

- A. Adhere to the requirements and provisions of KPDES General Permit (KYG20) for stormwater discharges to small Municipal Storm Sewer Systems (sMS4), where applicable.
- B. Adhere to the requirements and provisions of KPDES General Permit (KYR10) for stormwater discharges associated with small construction activities that disturb 1 acre or greater.
- C. At a minimum, provide the following:
 - 1. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 2. Minimize amount of bare soil exposed at one time.
 - 3. 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.
 - 4. Construct fill and waste areas by selective placement to avoid erosive exposed surface of silts or clays.
 - 5. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

3.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. Obtain and pay for all permits not provided by HCWD1 as required by governing authorities.
- B. Obtain and pay for temporary easements required across property other than that of HCWD1.
- C. Comply with applicable codes.

3.04 REMOVAL

- A. Completely remove temporary materials, equipment, and miscellaneous items upon completion of construction and approval of the Engineer.
- B. Repair damage caused by installation and restore to specified or original condition.

3.05 TEMPORARY ELECTRICITY

Electrical services for construction needs and for lighting and heating the work area will be provided by the Contractor.

3.06 TEMPORARY WATER

Water for testing water and sanitary sewer systems will be provided by HCWD1. Water for testing and flushing shall be metered by Contractor and quantity reported to HCWD1.

END OF SECTION 01 50 00

SECTION 01 55 27
TRAFFIC REGULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Construction parking control.
- B. Flagmen.
- C. Flares and lights.
- D. Haul routes.
- E. Removal of controls.

PART 2 - PRODUCTS

2.01 SIGNS AND DEVICES

- A. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
- B. 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 non-designated 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 any highway area affected by construction operations.
- B. Contractor shall abide by city, county, state, and federal military 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 to 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 REMOVAL OF CONTROLS

Remove equipment and devices when no longer required.

END OF SECTION 01 55 27

SECTION 01 57 13
EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Implementation of temporary and permanent erosion and sedimentation control.

1.3 SYSTEM DESCRIPTION

- A. The work specified in this Section consists of providing, maintaining and removing temporary erosion and sedimentation control.
- B. The CONTRACTOR shall follow the latest edition of the Kentucky Erosion and Sedimentation Control Handbook.
- C. Temporary erosion controls include, but or not limited to, grassing, mulching, watering and re-seeding on-site surfaces and spoil and borrow area surfaces, and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Federal Clean Water Act of 1987.
- D. Temporary sedimentation controls include, but or not limited to, silt dams, traps, barriers, filter stone and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Federal Clean Water Act of 1987, as amended.
- E. Basic Principles
 - 1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.
 - 2. Minimize the disturbed area and the duration of exposure to erosion elements.
 - 3. Stabilize disturbed areas immediately.
 - 4. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.
 - 5. Retain sediment on site that was generated on site.
 - 6. Minimize encroachment upon watercourses.
- F. Temporary Erosion and Sedimentation Control: In general, temporary erosion and sedimentation control procedures shall be directed toward the following:
 - 1. Preventing soil erosion at the source.

2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.
 3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.
- G. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the project site.

1.4 DEFINITIONS

- A. Temporary Berms: These berms are used temporarily at the top or base of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.
- B. Temporary Slope Drains: A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, sod, or other material that may be used to carry water down slopes to reduce erosion.
- C. Sediment Structures: Sediment basins, ponds, and traps are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.
- D. Check Dams: Check dams are barriers composed of large stones, sand bags, or other non corrodible materials placed across or partially crossing a natural or constructed drainway.
- E. Temporary Silt Fences: Silt fences are temporary sediment barriers consisting of a filter fabric stretched across and attached to supporting posts and entrenched. The silt fence is constructed of synthetic filter fabric, posts, and depending upon the strength of the fabric used, wire fence for support. The filter barrier is constructed of stakes and burlap or synthetic filter fabric.

1.5 QUALITY ASSURANCE

- A. General: Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated above and in these specifications.
- B. Conflicts: Where provisions of pertinent rules and regulations conflict with these specifications, the more stringent provisions shall govern.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Silt Fence
 1. Silt fence fabric shall be polymer type netting with a built-in cord running throughout the top edge of the fabric. Posts shall be steel or 4-inch diameter pressure treated fir, southern pine, or hemlock, and shall be a minimum 5 foot in length. Silt fence shall have

an equivalent opening size (EOS) of 40 to 100. Silt fence fabric shall have a minimum permeability of 40 gallons per minute per square foot.

2. Silt fence fabric shall be Mirafi 100X, Amoco 1380, or Exxon GTF-100 Series.
 3. Wire fence reinforcement shall be a minimum 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.
- B. Stone rip rap: Use sound, touch, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Riprap shall have less than 66% wear when tested in accordance with AASHTO T-96. Riprap shall be in accordance with the Kentucky Transportation Cabinet Standard Specifications.
- C. Inlet Protection
1. Right of Way inlet protection shall be Flexstorm Inlet Filters or Equal.
 2. Site Inlet Protection shall be Curlex Sediment Logs manufactured by American Excelsior Company or Equal.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL INSTALLATION

- A. Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from entering the waterways. The preferred method is to provide an undisturbed natural buffer, extending a minimal five feet from the water, to filter the run-off. Should this buffer prove infeasible due to construction activities being too close to the water, or if the amount of sediment overwhelms the buffer, the CONTRACTOR shall place silt fences to filter the run-off and, if necessary, place permanent riprap to stabilize the bank.
- B. Silt dams, silt fences, traps, barriers, check dams, appurtenances and other temporary measures and devices shall be installed as indicated on the approved plans and working drawing, shall be maintained until no longer needed, and shall then be removed. Deteriorated hay bales and dislodged filter stone shall be replaced with new materials.
- C. All erosion and sedimentation control devices, including check dams, shall be inspected by the CONTRACTOR at least weekly and after each rainfall occurrence and cleaned out and repaired by the CONTRACTOR as necessary.
- D. Temporary erosion and sedimentation control devices shall be installed and maintained from the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

3.2 PERMANENT EROSION CONTROL

- A. Permanent erosion control shall include the following:
1. Restoring the work site to its original contours, unless shown otherwise on the drawings or directed by the ENGINEER.

- B. Permanent erosion control measures shall be implemented as soon as practical after the completion of pipe installation or land disturbance for each segment of the project. In no event shall implementation be postponed when no further activities related to pipe installation would impact that portion or segment of the Project. Partial payment request may be withheld for those portions of the Project not complying with this requirement.

3.3 RIPRAP

- A. Unless shown otherwise on the drawings, riprap shall be placed where ordered by the ENGINEER. Carefully compact backfill and place riprap to prevent subsequent settlement and erosion.
- B. Preparation of foundations: The ground surface upon which the riprap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers.
- C. Placement of filter fabric: The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions, and debris. The fabric shall be placed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed so the upstream strip overlaps the downstream strip. The fabric shall be placed loosely so as to give and therefore avoid stretching and tearing during placement of the stones. The stones shall be dropped no more than three feet during construction. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals, or other contaminants. Any contaminated fabric or any fabric damaged during its installation or during placement of riprap shall be removed and replaced with uncontaminated and undamaged fabric at no expense to the OWNER.
- D. Placement of riprap: The riprap shall be placed on a 6-inch layer of soil, crushed stone, or sand overlaying the filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Riprap shall be placed with its top elevation conforming to the natural slope of the stream bank and stream bottom. Stone riprap shall be dumped into place to form a uniform surface and to the thickness specified on the drawings. The thickness tolerance for the course shall be - 6-inches and +12 inches. If the Contract Drawings or Bidding Documents do not specify a thickness, the course shall be placed to a thickness of not less than 18 inches.
- E. Repair of existing riprap ditches: The Contract Drawings show locations where existing riprap ditches will be disturbed in order to construct the new water main. The CONTRACTOR shall limit the amount of ditch disturbed to that which is necessary to construct the water main. Immediately after placement of the water main, the riprap ditch shall be repaired. The CONTRACTOR, at their option, may reuse the existing riprap providing it is free of all mud or any other deleterious matter and has not been made unusable by the action of the CONTRACTOR. The ENGINEER will determine as to the suitability of the material for reuse. Any shortage of materials to replace the ditch shall be replaced with new material by the

CONTRACTOR. If the CONTRACTOR chooses not to use the existing stone, the unused material shall be removed from the site. All new riprap used to repair/replace the existing ditches shall meet the requirements as specified in Article 2.1.D "Riprap" of this Section. Placement of the riprap will be in accordance with the requirements of Article 3.5.D of this Section.

3.4 TEMPORARY BERMS

- A. Temporary berm shall be installed using a mound of compacted earth with a minimum allowable height of 18 inches measured from the upslope side of the berm.
- B. Side slopes should be 1.5:1 or flatter with a minimum berm base width of 4.5 feet.
- C. The channel behind the berm shall have a positive grade to a stabilized outlet. If the channel is less than or equal to 2 percent, the channel shall be stabilized.

3.5 TEMPORARY SLOPE DRAINS

- A. Temporary slope drains shall consist of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, flexible rubber, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.
- B. Fiber matting and plastic sheeting shall not be used on slopes steeper than 4:1 except for short distances of 20 feet or less.
- C. All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drains shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet shall be properly constructed to channel water into the temporary slope drain. Energy dissipaters, sediment basins, or other approved devices shall be constructed at the outlet end of the slope drains to reduce erosion downstream. An ideal dissipater would be dumped rock or a small sediment basin, which would slow the water as well as pick up some sediment. All temporary slope drains shall be removed when no longer necessary.

3.6 SEDIMENT STRUCTURES

- A. The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. To facilitate cleanout the pool area should be cleared.
- B. Fill material for the embankment shall be free of roots or other woody vegetation, organic material, large stones, and other objectionable material. The embankment should be compacted in eight-inch layers by traversing with construction equipment.
- C. Embankment shall be sloped 2:1 on both sides, and have a height/width according to the following table with a maximum height of 5 feet:

EMBANKMENT DIMENSIONS	
H Ft.	W Ft.
1.5	2.0
2.0	2.0
2.5	2.5

- D. Pool volume must not exceed 67 cubic yards/acre.
- E. The sediment trap outlet shall be lined with 2 to 3-inches of coarse aggregate with a length in feet of 6 times the draining area in acres.
- F. Construction operations shall be carried out in such a manner that erosion and water pollution are minimized.
- G. The structure shall be removed and the area stabilized when the upslope drainage has been stabilized.
- H. All cut and fill slopes shall be 2:1 or flatter.

3.7 CHECK DAMS

- A. Check dams shall be utilized to retard stream flow or restrict stream flow within the channel. Check dams can be constructed of either stone or logs.
- B. All check dams shall be keyed into the sides and bottom of the channel. A formal design is not needed for check dams; however, the following criteria should be adhered to when specifying check dams:
 1. The maximum height of the check dam shall not exceed 2 feet. The center of the dam must be at least 6 inches lower than the outer edges.
 2. Stone check dams should be constructed of 2 to 3-inch stone with a 2:1 slope on the downside.
 3. Log check dams should be constructed of 4 to 6-inch logs. The logs should be embedded into the soil at least 18 inches.

3.8 TEMPORARY SILT FENCES

- A. Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem.
- B. Height of a filter barrier shall be a minimum of 15 inches and shall not exceed 18 inches.

END OF SECTION 01 57 13

SECTION 01 57 20
ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.01 SCOPE

For the purpose of this Specification, environmental protection is defined as the retention of the environment in Project construction and to enhance the natural appearance in its final condition. Environmental protection requires consideration of air and land and involves noise as well as other pollutants. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities in the performance of this Contract, the Contractor and his subcontractors shall comply with all applicable federal, state and local laws and regulations concerning environmental pollution control and abatement. This Section covers the furnishings of all labor, materials, equipment and performing all work required for the protection of the environment during construction operations except for those measures set forth in other Sections of these specifications.

1.02 PRECONSTRUCTION VIDEO

After the Contractor has staked or laid out the job and prior to the initiation of any construction activities, including the installation of erosion and sediment control BMPs, the entire project corridor shall be videoed in digital format on DVD. A copy of the DVD shall be provided to HCWD1.

1.03 PROTECTION OF LAND RESOURCES

The land resources within the Project boundaries and outside the limits of work performed under this Contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project.

1.04 RECORDING AND PRESERVING HISTORICAL AND ARCHAEOLOGICAL FINDS

In the event archaeological materials (arrowheads, stone tools, stone axes, prehistoric and historic pottery, bottles, foundations, Civil War artifacts, and other types of artifacts) are uncovered during the construction of this project, work is to immediately cease at the location and the Kentucky Heritage Council shall be contacted. The telephone number is (502) 564-7005. Construction shall not commence at this location until a written release is received from the Kentucky Heritage Council. Failure to report a find could result in legal action.

1.05 PROTECTION OF LAND AREAS

Except for any work on storage areas and access routes specifically assigned for the use of the Contractor under this Contract, the land areas outside the limits of permanent work performed under this Contract shall be preserved in their present condition. Contractor shall confine his construction activities to areas defined for work on the plans or specifically assigned for his use. No other areas shall be used by the Contractor without written consent of the HCWD1.

1.06 PROTECTION OF TREES AND SHRUBS

Reasonable care shall be taken during construction to avoid damage to vegetation.

The Contractor shall not deface, injure or destroy trees or shrubs, nor remove or cut them without prior approval from HCWD1. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage.

1.07 TREE PROTECTIVE STRUCTURES

Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured or otherwise damaged by the Contractor's equipment or by his other operations, he may direct the Contractor to provide temporary protection of such trees by placing boards, plans, or poles around them. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage.

1.08 RESTORATION OF DAMAGED TREES

Any tree scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. All scars made on trees shall be coated as soon as possible with an approved tree wound dressing.

Trees that are to remain, either within or outside established clearing limits, that are damaged by the Contractor so as to be beyond saving in the opinion of the Engineer, shall be immediately removed, if so directed, and replaced with a nursery-grown tree of the same species and size.

1.09 PROTECTION OF WATER RESOURCES

The Contractor shall control the disposal of fuels, oils, bitumens, calcium chloride, acids, or harmful materials, and shall comply with applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams while performing work under this Contract. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides and insecticides from entering public waters. Water used in on-site material processing, concrete curing, foundation and concrete cleanup, and other waste waters shall not be allowed to reenter a stream if an increase in the turbidity of the stream could result therefrom.

1.10 BURNING

Air pollution restrictions applicable to this project are as follows: Materials shall not be burned on the premises. If the Contractor elects to dispose of waste materials off the premises, by burning, he shall make his own arrangements for such burning area and shall, as specified in the General Conditions, conform to all applicable regulations.

1.11 DUST CONTROL

The Contractor shall maintain all excavations, stockpiles, access roads, waste areas, and all other work free from excess dust to such reasonable degree as to avoid causing a hazard or nuisance to others. Approved temporary methods consisting of sprinkling, chemical treatment, or similar methods will be permitted to control dust. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

1.12 EROSION CONTROL

Surface drainage from cuts and fills within the construction limits, whether or not completed, and

from borrow and waste disposal areas, shall be graded to control erosion within acceptable limits. Temporary control measures shall be provided and maintained until permanent drainage facilities are completed and operative. The area of bare soil exposed at any one time by construction operations, should be held to a minimum.

Any erosion control measures shown on the plans are considered to be minimum requirements. It is the Contractor's responsibility to provide erosion control and prevent migration of silt.

Contractor shall provide a Kentucky DOW approved Groundwater Protection Plan as stated in 401 KAR 5:037 before excavation is to begin.

1.13 CORRECTIVE ACTION

The Contractor shall, upon receipt of a notice in writing of any noncompliance with the foregoing provisions, take immediate corrective action. If the Contractor fails or refuses to comply promptly, HCWD1 may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs of damages by the Contractor unless it was later determined that the Contractor was in compliance.

1.14 POST-CONSTRUCTION CLEANUP, REMOVAL AND RESTORATION

The Contractor shall, unless otherwise instructed in writing by the Engineer, remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed areas shall be graded and filled and the entire area seeded.

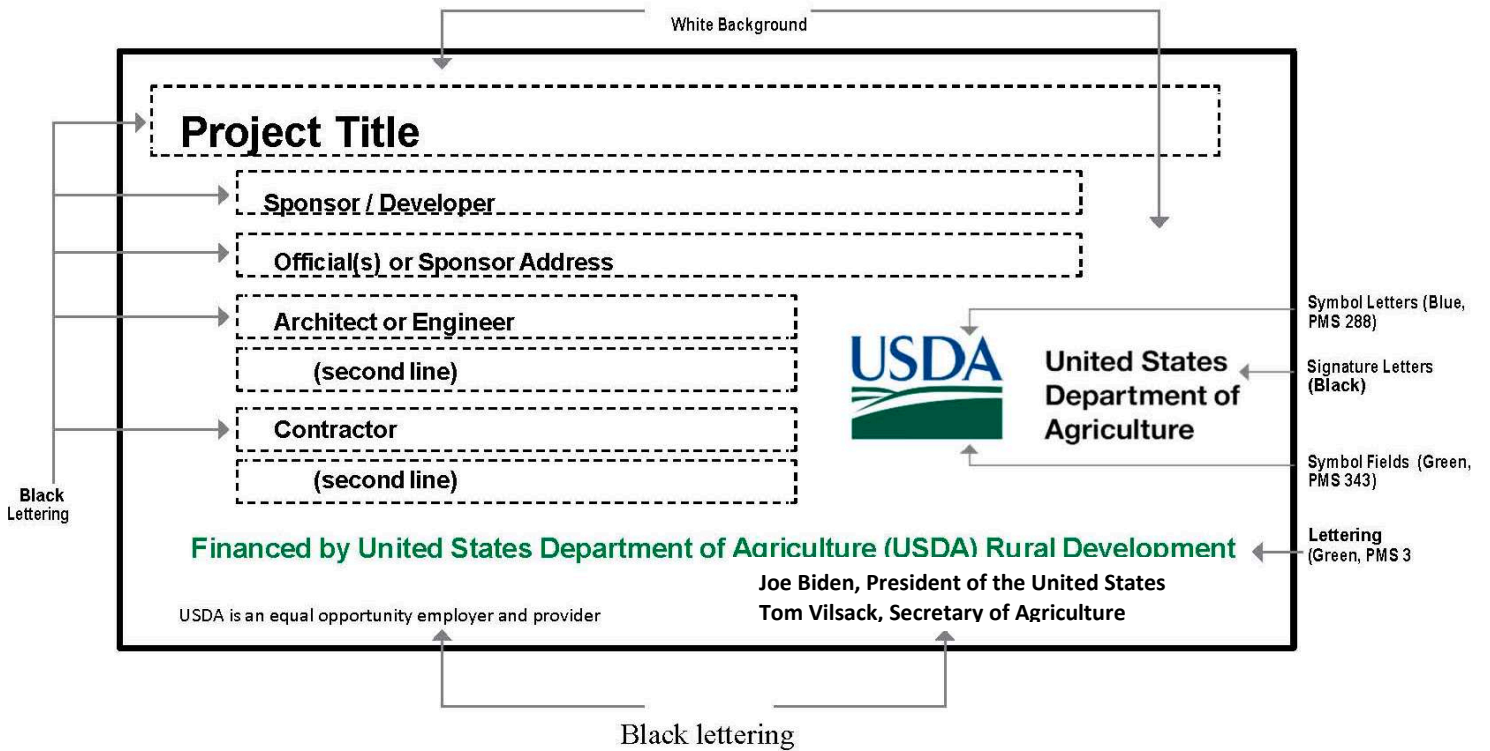
END OF SECTION 01 57 20

**SECTION 01 58 13
PROJECT SIGN TEMPLATE**

Contractor shall provide identification sign(s). Sign(s) shall conform to the template below. Sign shall be erected and visible during the entire construction phase of the project at a location agreed to by Owner and Agency.

Kentucky Bulletin 1780-1
Exhibit H
Page 1

**TEMPORARY CONSTRUCTION SIGN FOR RURAL
DEVELOPMENT PROJECTS**



Sign Dimensions: 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

END OF SECTION 01 58 13

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
 - 2. Section 01 42 00 "References and Abbreviations" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 01 33 00 "Submittals."
 - b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittals." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Engineer will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Products:

- a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
- b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

2. Manufacturers:

- a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
- b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Engineer's sample", provide a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

- B. Related Requirements:

1. Section 01 11 00 "Summary of Work" for limits on use of Project site.
2. Section 01 33 00 "Submittals" for submitting surveys.
3. Section 01 77 00 "Project Closeout" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, notify Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and

patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Engineer.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.

6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and **90 inches** in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 11 00 "Summary of Work."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

- a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
- 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
- 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Controls and Utilities."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 45 00 "Quality Control."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 76 10
PROTECTION OF INSTALLED WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

Protection for products, including Owner-provided products, after installation.

1.02 RELATED REQUIREMENTS

Division 1 - General Requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PROTECTION AFTER INSTALLATION

- A. Protect installed products and control traffic in immediate area to prevent damage from subsequent operations.
- B. Restrict traffic of any kind across planted lawn and landscape areas.

END OF SECTION 01 76 10

**SECTION 01 77 00
PROJECT CLOSEOUT**

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 01 78 39 - Project Record Documents.

1.02 SUBSTANTIAL COMPLETION

- A. The Contractor shall submit written certification to Engineer that project is substantially complete and list of major items to be completed or corrected.
- B. Engineer will make an inspection within seven days after receipt of certification, together with HCWD1's representative.
- C. Should Engineer consider that work is substantially complete:
1. Contractor shall prepare, and submit to Engineer, a list of the items to be completed or corrected, as determined by on-site observation.
 2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:
 - a. Date of Substantial Completion.
 - b. Contractor's list of items ("Punch List") to be completed or corrected, verified and amended by Engineer.
 - c. The time within which Contractor shall complete or correct work of listed items.
 - d. Time and date Owner will assume possession of work or designated portion thereof.
 3. Contractor: Complete work listed for completion or correction, within designated time.
- D. Should Engineer consider that work is not substantially complete:
1. He shall notify Contractor, in writing, stating reasons.
 2. Contractor: Complete work, and send second written notice to Engineer, certifying that Project or designated portion of project is substantially complete.
 3. Engineer will review work again.

1.03 FINAL INSPECTION

- A. Contractor shall submit written certification that:
1. Project has been inspected for compliance with Contract Documents.
 2. Work has been completed in accordance with Contract Documents.
 3. Equipment and systems have been tested in presence of Owner's representative and are operational.
 4. Project is completed and ready for final inspection.
- B. Engineer will make final on-site observation/review within seven (7) days after receipt of certification.

- C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.
- D. Should Engineer consider that work is not finally complete:
 - 1. He shall notify Contractor, in writing, stating reasons.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.
 - 3. Engineer will review the work again.

1.04 FINAL CLEAN UP

The work will not be considered as completed and final payment made until all final clean up has been done by the Contractor in a manner satisfactory to the Engineer.

1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: to requirements of Section 01 78 39.
- B. Warranties and Bonds: to requirements of particular technical specifications and Section 01 78 37.
- C. Affidavit of Payment of Debts and Claims 00 65 19.13
- D. Contractor's Affidavit of Release of Liens Form 00 65 19.16
- E. Consent of Surety to Final Payment 00 65 19.19

1.06 FINAL APPLICATION FOR PAYMENT

Contractor shall submit final applications in accordance with requirements of the Contract.

END OF SECTION 01 77 00

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittals" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. Three (3) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

- C. Initial Manual Submittal: Submit draft copy of each manual at least thirty (30) days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least fifteen (15) days before commencing demonstration and training. Engineer will return copy with comments.
 - 1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Engineer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents.

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:

1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Engineer.
 7. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in

manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor has delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.

9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.

3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.

6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
 - F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
 - G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data includes more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."
- F. Comply with Section 01 77 00 "Project Closeout" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 37
WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Review submittals to verify compliance with Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Performance and Payment Bonds.
- B. General Warranty of Construction.
- C. Warranties and Bonds required for specific products: As listed in other Specification sections.

1.03 WARRANTY BONDS OR CORPORATE GUARANTEES IN LIEU OF EXPERIENCE RECORD

- A. When specifically requested in the products and installation general provisions of a Specification section for a particular piece of equipment or product, a record of five (5) years of successful full-scale operation shall be required from the equipment manufacturer. This record of full-scale operation shall be from existing facilities utilizing the equipment or product specified, in an application similar to the application intended for this Project.
- B. The manufacturer shall certify in writing to the Contractor that it has the required record of successful full-scale operation. This certification shall be submitted by the Contractor with his construction materials and/or equipment data list. In the event the manufacturer cannot provide the five (5) year certification of experience to the Contractor, the Contractor shall furnish within thirty (30) days after the Notice of Award, a Warranty Bond or Corporation Guarantee from the equipment manufacturer written in the name of the Contractor and acceptable to HCWD1. The Warranty Bond or Corporate Guarantee shall be kept in force for five (5) years from the Date of Substantial Completion of the Contract less the number of years of experience the manufacturer may be able to certify to the Engineer. As a minimum, the Bond or Guarantee shall be in force for one (1) year after the Date of Substantial Completion of the Contract. The Warranty Bond shall be written in an amount equivalent to the manufacturer's quotation, the Contractor's installation cost plus 100 percent (100%). The Warranty Bond or Corporate Guarantee will assure HCWD1 that, if in the judgement of the Engineer, the equipment does not perform its specified function, the Contractor shall remove the equipment and install equipment that will perform the specified function and the work by the Contractor shall be paid for by the Warranty Bond or Corporate Guarantee.

1.04 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.

1.05 FORM OF SUBMITTALS

- A. Prepare in duplicate packets in the following format:
 - 1. Size 8 1/2-inch x 11 inches, 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 the Title of Project and Name of Contractor.
- B. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.06 TIME OF SUBMITTALS

- A. Make submittals within ten (10) days after date of substantial completion, prior to final request for payment.
- B. 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.

1.07 SUBMITTALS REQUIRED

Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications. Additionally, the Contractor shall warrant the entire contract, including all concrete and paving to be free from defects in installation for one (1) year from the date of startup. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Contractor shall repair the defect without cost to HCWD1.

END OF SECTION 01 78 37

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 01 33 00 - Submittals.

1.02 MAINTENANCE OF DOCUMENTS

- A. Maintain at job site, one copy of Contract Drawings, Specifications, Addenda, and Shop Drawings.
- B. Store documents in location, apart from documents used for construction.
- C. Maintain documents in clean, dry legible condition.
- D. Do not use record documents for construction purposes.
- E. Make documents available at all times for inspection by Engineer and HCWD1.

1.03 RECORDING

- A. Label each document "RECORD DRAWING" 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.

1.04 SUBMITTAL

A. At completion of project, deliver:

1. Record drawings.
2. Spare parts, if necessary.
3. Operations and maintenance manuals.
4. Start-up reports of vendors, suppliers, subcontractors.
5. Release of Lien.

B. Prior to final payment, Contractor should deliver:

1. Request letter of certification and initiation of warranty period from Engineer.

C. 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 01 78 39

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.
- B. Pre-instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Engineer.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Operating standards.
 - c. Regulatory requirements.
 - d. Equipment function.
 - e. Operating characteristics.
 - f. Limiting conditions.
 - g. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.

- c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Engineer will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Engineer, with at least seven (7) days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 79 00

DIVISION 2: EXISTING CONDITIONS

SECTION 02 42 23
REMOVAL OF EXISTING EQUIPMENT AND PIPING

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish all materials, equipment, and labor required to remove, handle, store and dispose of all materials from existing structures and piping shown on the Drawings, directed by the Engineer or required for the completion of the work, including all necessary excavation and backfilling.
- B. The Contractor shall remove from existing structures and store as directed or dispose of in an approved manner, all valves and piping, mechanical equipment, plumbing, heating, electrical and ventilating fixtures, pipes, ducts, wires and equipment, doors and windows, floor grating and cover plates, steel stairs, pipe railing and the like which are not to remain in service in the finished work, whether or not shown on the Drawings and/or specified herein.
- C. The work specified herein and shown on the Drawings is intended to give a general idea of the scope of this work but must not be construed as covering it entirely. The Contractor shall visit the site and judge the amount of work required and the problems the Contractor might encounter in the performance of the work.

1.2 EQUIPMENT AND PIPING TO BE REMOVED

- A. The existing equipment and piping to be removed shall include, but not be limited to, the following:
 - 1. Existing Well Pump and Motor.
 - 2. Existing Control Panel
 - 3. Existing Check Valves and associated discharge piping
 - 4. Existing Well Casing
 - 5. Existing SCADA Cabinet
 - 6. Existing Metal Platform and Stairs
 - 7. Associated Electrical conduit, wiring, and equipment
 - 8. Existing Fence

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All concrete, mortar, grout, steel reinforcement and backfill used in patching, plugging or repairing shall comply in all respects with the applicable material requirements of these Specifications.

PART 3 - EXECUTION

3.1 REMOVAL

- A. The Contractor shall exercise full care and shall use such methods and equipment during removal as will maintain the usefulness of the various materials and equipment removed. The sequence and order of removal and the method of storing and disposal of removed equipment and piping shall be at all times subject to the discretion and approval of the Engineer.
- B. Any damage done to structures or equipment during removal and any patching, plugging of holes or repairs necessitated because of removal of equipment and piping shall be repaired as directed by, and to the satisfaction of, the Engineer and the cost thereof shall be included in the Contract Price.
- C. Equipment specified to be removed shall be removed completely, including all related accessories and bases. Any embedded items such as anchor bolts, steel reinforcement, conduit and piping shall be removed. Penetrations shall be plugged on both sides, leave threaded wall mounts but remove welded brackets. The surface shall then be repaired to match adjacent surfaces in finish and appearance.
- D. Prior to removing any electrical equipment, all power to the equipment shall be shut off and properly locked out. All power and control wiring for the equipment shall then be disconnected at the starter or circuit breaker, as applicable, and removed from the conduit. Unused conduits shall be plugged.
- E. Blemishes or unsightly areas on walls and floors left after removal of equipment shall be cleaned and refinished as necessary to match adjacent surfaces.
- F. All holes and openings left after removal of equipment shall be filled or plugged to provide a neat and workmanlike appearance. Paint as specified in Division 09.
- G. Where piping designated for removal passes through concrete walls, the openings shall be suitably plugged or capped. Wall pipes and wall sleeves shall be sealed with blind flanges or mechanical joint plugs. Steel pipe sleeves shall be filled with nonshrink grout.
- H. Where equipment or piping designated for removal serves to support other equipment or piping designated to remain in service, the Contractor shall provide permanent supports in place of the removed equipment and piping. Where it is necessary to temporarily remove other equipment, piping or electrical work in order to gain access to an item of equipment or piping designated for removal, the Contractor shall restore all such equipment, piping or electrical work to its original condition.
- I. Abandoned Piping: Existing vitrified clay, concrete, PVC, cast iron and steel piping to be abandoned shall be cut and plugged or capped at each end. Where existing piping interferes with new piping or construction, it shall be removed beyond the limits required for proper completion of the work and the open ends plugged or capped. Unless otherwise shown, lines shall be plugged or capped at least 1-inch behind or below finished building surfaces and at least 12-inches below outside grade surfaces.
- J. Piping and Valving Reinstallation: The Contractor shall include in the Contract Price the cost of removing, refitting, and reinstalling certain pipe, fittings and valves as shown on the Drawings or as deemed by the Engineer to be satisfactory for reuse.

- K. Removal of Existing Concrete, Structural Steel, and Masonry: Existing concrete, steel and masonry shall be removed and disposed of as directed by the Engineer.
- L. Storage: All materials removed shall remain the property of the Owner and shall be carefully moved and stored on the site where directed by the Engineer. Mechanical and electrical equipment shall be stored indoors. If the equipment is too large to store indoors, it shall be stored outdoors above ground and under cover.
- M. Disposal: The Engineer will direct the Contractor to assume ownership of and dispose of off site any removed equipment, piping and materials which the Engineer deems worthless. The cost of disposing of any or all of the removed equipment, piping and materials shall be included in the lump sum prices bid and no separate payment will be made therefore. If the Owner chooses to retain ownership of any removed equipment, piping and materials the Contractor shall properly store and assist the Owner with handling the items.

END OF SECTION 02 42 23

DIVISION 3: CONCRETE

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Formwork.
- B. Reinforcing Steel.
- C. Expansion and Contraction Joints.
- D. Waterstops
- E. Concrete.

1.03 RELATED REQUIREMENTS

- A. Division 31 – Trench Excavation and Backfill.

1.04 REFERENCES

- A. ACI 350R Environmental Engineering Concrete Structures.
- B. ACI318 - Building Code Requirements for Reinforced Concrete.
- C. ACI347 - Recommended Practice for Concrete Formwork.
- D. CRSI - Manual of Standard Practice.
- E. CRSI - Placing Reinforcing Bars.
- F. ASTM - A-615, A-120, A-185, C-31, C-39.

1.05 SUBMITTALS

- A. The Contractor shall submit the following data to the Engineer for review:
 - 1. Mix designs for all mixes proposed or required to be used, including all mixes containing admixtures.
 - 2. Certification by the manufacturer that cement meets the Specification contained herein.
 - 3. Shop drawing for reinforcing steel showing bar schedules, location, and splices.

4. Reports on laboratory compression tests of cylinders taken during concrete placement.
5. Manufacturer's cut sheets for all other concrete related products.

PART 2 - PRODUCTS

2.01 CLASSES OF CONCRETE AND USAGE

- A. Structural concrete of the various classes required shall be proportioned to produce the following 28-day compressive strengths:
 1. Selection of Proportions for 4,500 psi Concrete:
 - a. 4,500 psi compressive for strength at 28 days.
 - b. Type I/II cement plus air.
 - c. Maximum water/cement ratio - 0.42.
 - d. Minimum cement content - 564 lbs. (6.0 bags)/cubic yard concrete. e. Nominal maximum size coarse aggregate - No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
 - f. Air content - 5% plus or minus 1% by volume.
 - g. Slump - 4 inches in accordance with ASTM C-143, when measured with only an air entraining admixture. Additional slump is allowed by use of water reducing or superplasticizing admixtures.
 2. Selection of Proportions for 3,000 psi Concrete:
 - a. 3,000 psi compressive strength at 28 days.
 - b. Type I/II cement plus air.
 - c. Maximum water/cement ratio - 0.56.
 - d. Minimum cement content - 470 lbs. (5.0 bags)/cubic yard concrete. e. Nominal maximum size coarse aggregate - No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
 - f. Air content - 5% plus or minus 1% by volume.
 - g. Slump - 4 inches in accordance with ASTM C-143, when measured with only an air entraining admixture.
- B. Concrete shall be used as follows:
 1. 4,500 psi concrete for all concrete work except as noted below.
 2. 3,000 psi concrete for encasement of piping where indicated, and thrust blocking.
- C. All testing of aggregates and determination of proportions shall be or have been performed by a recognized independent testing laboratory.
- D. Cement for exposed concrete shall have a uniform color classification.
- E. Type I/II cement conforming to ASTM C-150 shall be used in all concrete.

- F. Coarse aggregate shall be crushed stone having clean, hard, uncoated particles, and shall be free from injurious amount of soft, friable, thin, elongated or laminated pieces. Coarse aggregates shall conform to all requirements of ASTM C-33.
- G. Fine aggregates shall be natural sand having clean, hard, uncoated grains, free from injurious amounts of clay, dust, organic matter or other deleterious substances, and shall conform to ASTM C-33.
- H. Water for concrete shall be clean, fresh, and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

2.02 ADMIXTURES

- A. An air entraining admixture shall be used on all concrete and shall be the neutralized vinsol resin type such as Master Builders MB-VR, Euclid Chemical Company AIR-MIX or equivalent. The admixture shall meet the requirements of ASTM C-260.
- B. Other admixtures (water reducing agents, accelerating agents, retarding agents, superplasticizing agents) shall be considered where necessary to meet the needs of construction.
- B. Admixtures shall be used in concrete design mixes in the same manner and proportions as in the field so that the effects of the admixtures are included in preliminary test submitted to the Engineer for review prior to the start of construction.

2.03 REINFORCEMENT

- 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. Welded wire fabric shall conform to ASTM A-185 and shall be of weight and gauge as indicated on the Drawings.
- C. 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 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 stone concrete blocks.

2.04 FORMS

- A. Forms shall be of suitable material, design, and construction so as to be rigid, tight enough to prevent the passage of mortar, and plane surfaces with a tolerance of 1/16-inch in 4 feet.
- B. For surfaces to be given burlap-rubbed finish, the form surface in contact with the concrete shall be made of heavy gauge metal, new plywood (used plywood which, in the opinion of the Engineer, is substantially equal to new plywood may be used), tempered wood fiberboards with smooth surface, or similar materials. Metal forms or form linings shall have square

edges so that the concrete will not have fins or fluting. Forms shall not be pieced out by use of materials different from those in the adjacent form or in such manner as will detract from the uniformity of the finished surface.

- C. For surfaces other than those to be given burlap-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 reasonably good, as accepted. Metal forms shall be of an acceptable type for the work involved. Edges of forms in contact with concrete shall be flush within 1/16-inch.
- D. Form for walls, columns, or piers shall have removable panels at the bottom for cleaning, inspection, and scrubbing-in of bonding grout. 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.
- E. Forms for exposed surfaces shall be built with 3/4-inch chamfer strips attached to produce smooth, straight chamfers at all sharp edges of concrete.
- F. 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 inch to the face of the concrete.
 - 2. That part of the tie which is to be removed shall be at least 1/2-inch in diameter, or if smaller, it shall be provided with a wood or metal cone 1 inch 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 subject to hydrostatic pressure shall be provided with acceptable water stops, such as washers, securely fastened to the ties.

2.05 OTHER MATERIALS

- A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.
- B. Premolded expansion-joint filler strips shall conform to ASTM D-1752 and shall be 3/8-inch thick unless otherwise shown.
- C. Joint sealants shall conform to ANSI 116.1. The following joint sealants are acceptable:
 - 1. Colma by Sika Corporation.
 - 2. Hornflex by A. C. Horn, Inc.
 - 3. Sonolastic by Sonneborn Division of Contech, Inc.

D. GROUT

1. Precision-support grout shall consist of a non-shrink, ready-to-use, precision grout material; proportioned, pre-mixed and packaged at the factory; delivered to the job site to place with only the addition of water; forming, placing and curing as stipulated by the manufacturer.
2. Grouts which depend upon aluminum powders, chemicals, or other agents which produce gas for expansion are not acceptable.
3. Precision-support grout shall also meet the following requirements:
 - a. Free of gas producing agents.
 - b. Free of oxidizing catalysts.
 - c. Free of inorganic accelerators, including chlorides.

E. Construction Joint Waterstops:

1. Polyvinylchloride (PVC) Waterstops:
 - a. Provide PVC waterstops complying with Corps of Engineers CRD-C572.
 - b. Provide serrated type with a minimum thickness of 3/8 inch by a minimum width of 6 inches may be provided in specific applications as approved by the ENGINEER.
 - c. Provide PVC waterstops as manufactured by Greenstreak Plastic Products company; Vinylex Corporation, or equivalent product.
2. Adhesive Waterstop:
 - a. Provide pre-formed adhesive waterstop in construction joint locations where shown, or as alternative to PVC waterstop where appropriate.
 - b. The preformed waterstop shall meet or exceed all requirements of Federal Specifications SS-S-210A, "Sealing Compounds for Expansion Joints".
 - c. Provide adhesive waterstops as manufactured by Synko-Flex Products, Division of Henry Products, Inc.; or equivalent product.
3. Hydrophilic Waterstops:
 - a. Hydrophilic waterstop may be used as an alternate to the adhesive waterstop.
 - b. Provide waterstops as manufactured by Greenstreak Plastic Products Company; Adeka, Inc.; or equivalent product.

F. Membrane Forming Curing compound: ASTM C 309, Type I-D.

1. Provide without fugitive dye when requested by Engineer.

G. Epoxy Bonding Agent: Provide two-component epoxy resin bonding agent as manufactured by Sika Chemical Corporation; A.C. Horn, Incorporated; or equivalent product.

H. Adhesive Dowels:

1. Drilling equipment used and installation of adhesive dowels shall be in accordance with manufacturer's instructions.
2. Assure that embedded items are protected from damage and are not filled in with concrete.
3. Unless otherwise shown or approved by Engineer, embedment depths shall be based on a compressive strength of 2,500 psi when embedded into existing concrete.)
4. The Contractor shall comply with the adhesive material manufacturer's installation instructions on the hole diameter. The Contractor shall properly clean out the hole utilizing a synthetic brush and compressed air to remove all loose material from the hole, prior to installing adhesive capsules or material. Proper mixing of the two-component system shall be done to the manufacturer's recommendations.
5. Adhesive material manufacturer's representative shall observe and demonstrate the proper installation procedures for the adhesive dowels and adhesive material at no additional expense to HCWD1. Each installer shall be certified in writing by the manufacturer to be qualified to install the adhesive dowels.
6. Provide two-component dowel installation adhesive as manufactured by Hilti Corporation, or approved equivalent product.

PART 3 - EXECUTION

3.01 FORMING

- A. Forms shall be so constructed and placed that the resulting concrete will be of the shape, lines, dimensions and to the elevations indicated on the Drawings or specified, and exposed concrete will be substantially free from board or grain marks, poorly matched joints, and other irregularities or defects.
- 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. All falsework to support structural slabs, beams, girders, etc., shall be designed to safely and adequately support the concrete and forms during placement and curing. The adequacy and safety of the falsework shall be the sole responsibility of the Contractor.
- D. All forms shall be oiled with an acceptable nonstaining oil or liquid form coating before reinforcement is placed.
- 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.
- F. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of days- degrees*:
 1. Beams and slabs: 500 day-degrees.
 2. Walls and vertical surfaces: 100 day-degrees.
 3. *Day-degree: Total number of days times average daily air temperature at surface of

concrete. For example, 5 days at a daily average temperature of 60 degrees F, equals 300 day-degrees.

- G. Shores under beams and slabs shall not be removed until the concrete has attained at least 60 percent of the specified compressive strength and also sufficient strength to support safely its own weight and the construction live loads upon it.

3.02 PLACING REINFORCEMENT

- A. Reinforcement shall be bent cold to the dimensions and shapes shown on the Drawings and within tolerances specified in the CRSI Manual of Standard Practice.
- B. 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.
- C. 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 at all intersections except where spacing is less than one foot in both directions, then alternate intersections may be tied.
- D. Distance from the forms shall be maintained by means of stays, blocks, ties, hangers or other approved supports. Blocks for holding the reinforcement from contact with the forms shall be precast mortar blocks or approved metal chairs. Layers of bars will be separated by precast mortar blocks or other equally suitable devices; the use of pebbles, pieces of broken stone or brick, metal pipe and other such blocks will not be permitted. If fabric reinforcement is shipped in rolls, it shall be straightened into flat sheets before being placed.
- E. Before any concrete is placed, the Engineer 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.
- F. 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.

3.03 TESTING AGGREGATES AND DETERMINING PROPORTIONS

- A. No concrete shall be used in the work until the materials and mix design have been accepted by the Engineer.
- B. The conformity of aggregates to the Specifications hereinbefore given shall be demonstrated and determined by tests per ASTM C-33 made with representative samples of the materials to be used on the work.
- C. The actual proportions of cement, aggregates, admixtures and water necessary to produce concrete conforming to the requirements set forth herein shall be determined by making test cylinders using representative samples of the materials to be used in the work. A

set of four standard 6-inch cylinders shall be made and cured per ASTM C-31. Two shall be tested at 7 days and two at 28 days per ASTM C-39. The slump shall not be less than the greatest slump expected to be used in the work.

- D. Reports on the tests and a statement of the proportions proposed for the concrete mixture, shall be submitted in triplicate to the Engineer for review as soon as possible, but not less than five days prior to the proposed beginning of the concrete work. If the Contractor furnishes in writing, similar, reliable detailed information from an acceptable source, and of date not more than four months prior to the time when concrete will be used on this project, the above requirements for laboratory test may be modified by the Engineer. Such data shall derive from mixtures containing constituents, including the admixtures where used, of the same types and from the same sources as will be used on this project.
- E. The Engineer shall have the right to make check tests of aggregates and concrete, using the same materials, and to order changes as may be necessary to meet the specified requirements.
- F. The Contractor may request permission to add water at the job site; and when the addition of water is permitted by the Engineer, the quantity added shall be the responsibility of the Contractor and in no case shall the total water per bag of cement exceed the ratio set forth herein.
- G. If concrete of the required characteristics is not being produced as the work progresses, the Engineer may order such changes in proportions or materials or both, as may be necessary to secure concrete of the specified quality. The Contractor shall make such changes at his own expense and no extra compensation will be allowed because of such changes.

3.04 MIXING

- A. All central-plant and rolling-stock equipment and methods shall conform to the Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready Mixed Concrete Association, as well as the ACI Standards for measuring, Mixing and Placing Concrete (ACI 614), and with the ASTM Standard Specification for Ready-Mixed Concrete, Designation C94, insofar as applicable.
- B. Ready-mixed concrete shall be transported to the site in watertight agitator or mixer trucks. The quantity of concrete to be mixed or delivered in any one batch shall not exceed the rated capacity of the mixer or agitator for the respective conditions as stated on the nameplates.
- C. Central-mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch, and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the premixed concrete is placed in the truck and shall continue without interruption until discharge. For transit- mixed concrete the major portion of the mixing water shall be added and mixing started immediately after the truck is charged.
- D. The amount of water initially added shall be recorded on the delivery slip for the Engineer's information; no additional water shall be added, either in transit or at the site, except as directed. Mixing (at mixing speed) shall be continued for at least 10 minutes followed by

agitation without interruption until discharge. Concrete shall be discharged at the site within 1-1/2 hours after water was first added to the mix, and shall be mixed at least 5 minutes after all water has been added.

- E. Concrete which has become compacted or segregated during transportation to or in the site of the work shall be satisfactorily remixed just prior to being placed in the forms.
- F. Partially hardened concrete shall not be deposited in the forms. The retempering of concrete which has partially hardened (that is, the remixing of concrete with or without additional cement, aggregate, or water) will not be permitted.

3.05 COMPRESSION TESTS

- A. During the progress of the work, at least one (1) set of four (4) compression test cylinders shall be made for each 50 cubic yards of concrete or major fraction thereof, and not less than one such set for each type of concrete for each day's pouring. Cylinders made in the field shall be made and cured in accordance with the ASTM Standard Method of Making and Curing Concrete Test Specimens in the Field, Designation C31, except that wherever possible molds shall be left on the cylinders until they have reached the laboratory. Testing services to satisfy the requirements of ACI shall be paid for by the Contractor at his expense. Testing lab must be approved by the Engineer.
- B. One cylinder of each set shall be broken in accordance with ASTM C-39 at seven (7) days and the other two at twenty-eight (28) days. Two copies of these test results shall be submitted to the Engineer on the same day of the tests.
- C. On evidence of these tests, any concrete that fails to meet the specified strength requirements shall be strengthened or replaced as directed by the Engineer at the Contractor's expense.

3.06 METALWORK IN CONCRETE

- A. All trades shall be notified, at the proper time, to install items to be embedded in concrete.
- B. All castings, inserts, conduits, and other metalwork shall be accurately built into or encased in the concrete by the Contractor as directed, and all necessary precautions shall be taken to prevent the metalwork from being displaced or deformed.
- C. Anchor bolts shall be set by means of substantial templates.

3.07 PLACING AND COMPACTING CONCRETE

- A. At least twenty-four (24) hours before the Contractor proposes to make any placement of concrete, he shall notify the Engineer of his intention and planned procedure. Unless otherwise permitted, the work shall be so executed that a section begun on any day shall be completed during daylight of the same day.
- B. No concrete shall be placed until the subgrade has been accepted in accordance with the

requirements of Section 01 45 00, Quality Control, nor shall it be placed on frozen subgrade or in water. Placement of concrete shall not be scheduled until the forms, reinforcing, and preliminary work have been accepted. No concrete shall be placed until all materials to be built into the concrete have been set and have been accepted by the various trades and by the Engineer. All such materials shall be thoroughly clean and free from rust, scale, oil, or any other foreign matter.

- C. Forms and excavations shall be free from water and all dirt, debris, and foreign matter when concrete is placed. Except as otherwise directed, wood forms and embedded wood called for or allowed shall be thorough wetted just prior to placement of concrete.
- D. Concrete placed at air temperatures below 40 degrees shall have a minimum temperature of 50 degrees F. and a maximum of 70 degrees F. when placed.
- E. Concrete shall be transported from the mixer to the place of final deposit as rapidly as practicable and by methods which will prevent separation of ingredients and avoid rehandling.
- F. Chutes for conveying concrete shall be metal or metal-lined and of such size, design, and slope as to ensure a continuous flow of concrete without segregation. The slope of chutes shall be not flatter than 1 on 2 and all parts of a chute shall have approximately the same slope. The discharge end of the chute shall be provided with a baffle, or, if required, a spout; and the end of the chute or spout shall be kept as close as practicable to, but in no event more than 5 feet above the surface of the fresh concrete. When the operation is intermittent, the chute shall discharge into a hopper.
- G. In thin sections of considerable height (such as walls and columns), concrete shall be placed in such a manner as will prevent segregation and accumulations of hardened concrete on the forms or reinforcement above the mass of concrete being placed. To achieve this end, suitable hoppers, spouts with restricted outlets, etc., shall be used as required or permitted unless the forms are provided with suitable openings.
- H. Chutes, hoppers, spouts, etc., shall be thoroughly cleaned before and after each run and the water and debris shall not be discharge inside the form.
- I. For any one placement, concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section, and so as to maintain, until the completion of the unit, an approximately horizontal, plastic surface.
- J. No wooden spreaders shall be left in the concrete.
- K. During and immediately after being deposited, concrete shall be thoroughly compacted by means of suitable tools and methods, such as internal-type mechanical vibrators operating at not less than 5,000 rpm., or other tool spading, to produce the required density and quality of finish. Vibration shall be done only by experienced operators under close supervision and shall be carried on in such a manner and only long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents, "pumping" of air, or other objectionable results. All vibrators shall be

supplemented by proper spade puddling approximately 2 to 3 inches away from forms to remove included bubbles and honeycomb. Excessive spading against the forms, causing the deposition of weak mortar at the surface, shall be avoided.

- L. The concrete shall be thoroughly rodded and tamped about embedded materials so as to secure perfect adhesion and prevent leakage. Care shall be taken to prevent the displacement of such materials during concreting.

3.08 BONDING CONCRETE AT CONSTRUCTION JOINTS

- A. In order to secure full bond at construction joints, the surface of the concrete previously placed (including vertical, inclined, and substantially horizontal areas) shall be thoroughly cleaned of foreign materials and laitance, if any, and then roughened.
- B. The previously placed concrete at the joint shall be saturated with clean water and kept thoroughly wet overnight, after which all pools shall be removed. After free or glistening water disappears, the concrete shall be given a thorough coating of neat cement mixed to a suitable consistency. The coating shall be 1/8-inch thick on vertical surfaces and 1/4-inch thick on horizontal surfaces, and shall be well scrubbed in by means of stiff bristle brushes wherever possible. New concrete shall be deposited before the neat cement dries.

3.09 CURING AND PROTECTION

- A. All concrete, particularly slabs and including finished surfaces, shall be treated immediately after concreting or cement finishing is completed, to provide continuous moist curing for at least seven days, regardless of the adjacent air temperature. Walls and vertical surfaces may be covered with continuously saturated burlap, or kept moist by other acceptable means. Horizontal surfaces, slab, etc., shall be ponded to a depth of 1/2-inch wherever practicable, or kept continuously wet by the use of lawn sprinklers, a complete covering of continuously saturated burlap, or by other acceptable means.
- B. For at least seven (7) days after having been placed, all concrete shall be so protected that the temperature at the surface will not fall below 45 degrees F.
 - 1. No manure, salt, or other chemicals shall be used for protection.
 - 2. Wherever practicable, finished slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

3.10 TRIMMING AND REPAIRS

- A. The Contractor shall use suitable forms, mixture of concrete, and workmanship so that concrete surfaces, when exposed, will require no patching.
- B. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed, recesses left by the removal of form ties shall be filled, and surface defects which do not impair structural strength shall be repaired.
- C. Defective concrete shall be cut perpendicular to the surface until sound concrete is reached,

but less than 1 inch deep. The remaining concrete shall be thoroughly roughened and cleaned. Concrete around the cavity or the form-tie recess shall be thoroughly wetted and promptly painted with a 1/16- inch brush coat of neat cement mixed to the consistency of lead paint. The hole shall then be filled with mortar.

1. Mortar shall be 1:1-1/2 cement and sand mix with sufficient white cement, or fine limestone screenings in lieu of sand, to produce a surface matching the adjoining work. Cement and sand shall be from the same sources as in the parent concrete.
 2. For filling form-tie recesses, the mortar shall be mixed slightly damp to the touch (just short of "balling"), hammered into the recess until it is dense and an excess of paste appears on the surface, and then troweled smooth. Mortar in patches shall be applied so that after partial set it can be compressed and rubbed to produce a finish flush and uniform in texture with the adjoining work. All patches shall be warm-moist cured as above specified.
- D. The use of mortar patching as above specified shall be confined to the repair of small defects in relatively green concrete. If substantial repairs are required, the defective portions shall be cut out to sound concrete and the masonry replaced by means of a cement gun, or the masonry shall be taken down and rebuilt, all as the Engineer may decide or direct.

3.11 SURFACE FINISH

- A. Fins and irregularities on formed surfaces to receive no other finish shall be smoothed.
- B. The top of concrete on which other concrete or unit masonry will later be placed shall be struck off true at the surface indicated on the Drawings or as permitted by the Engineer, as the concrete is being placed. As soon thereafter as the condition of the concrete permits and before it has hardened appreciably (normally within 2 hours after being deposited), all water, scum, laitance, and loose aggregate shall be removed from the surface by means of wire or bristle brooms in such a manner as to leave the coarse aggregate slightly exposed and the surface clean.
- C. Concrete surfaces shall be finished as follows, except as otherwise required by various sections of the Specifications or shown on the Drawings.
1. Wood-float finish shall be given to all top, substantially horizontal, exposed surfaces.
 2. Burlap-rubbed finish shall be given to all interior and exterior surfaces placed against forms which will be exposed to view on completion of the work. (Finish shall be to one foot below ground and below normal liquid surface elevations).
 3. All surfaces shaped without forms and over which liquids will flow shall be given a steel-trowel finish.
 4. Concrete surfaces to which roof insulation or roofing are to be applied shall be finished sufficiently smooth to receive the roofing material, as obtained by steel trowel or very smooth wood-float finish.

3.12 METHOD OF FINISHING

- A. Broomed Finish: Surfaces to be given broomed finish shall first be given a steel-trowel finish. Immediately after troweling, the surface shall be lightly brushed in one direction

with a hair broom to produce a nonslip surface of uniformly good appearance.

B. Wood-float Finish:

1. Surfaces to be given a wood-float finish shall be finished by tamping with special tools to force aggregates away from the surface, and screeding with straight edges to bring the surface to the required line.
2. As soon after the condition of concrete permits and before it has hardened appreciably, all water, film, and foreign material which may work to the surface shall be removed. Rough finishing shall be done with straight edges and derbies. Machine floating if used, shall not be started until the surface will support the float adequately without digging in and bringing excess fines to the surface. At such time, a minimum of machine and hand floating with a wood float shall be employed to bring the finish to a true and uniform surface with no coarse aggregate visible.
3. Under no circumstances will sprinkling with water or dusting with cement be permitted during finishing of the slab.

C. Steel Trowel Finish: Surfaces to be given a steel-trowel finish shall first be given a wood-float finish. This shall be followed by hand troweling with steel trowels to bring the surface to a uniform, smooth, hard, impervious surface free from marks and blemishes. Troweling shall not be started until all water has disappeared from the surface. Over-troweling shall be avoided. Dusting with dry cement or other mixtures or sprinkling with water will not be permitted in finishing.

D. Burlap Rubbed Finish:

1. Immediately after the forms have been stripped and before the concrete has changed in color, all fins and other projections shall be carefully removed by use of a hammer or other suitable means, and imperfections shall be repaired as hereinbefore specified under "Trimming and Repairs". While the surface is still damp, a thin coat of cement slurry of medium consistency shall be applied by means of bristle brushes to provide a bonding coat within pits and minor blemishes in the parent concrete; the coating of large areas of the surface with this slurry shall be avoided.
2. Before the slurry has dried or changed color, a dry (almost crumbly) grout composed of 1 volume of cement to 1-1/2 volumes of masonry sand shall be applied. The sand shall have a fineness modulus of approximately 2.25 and comply with the gradation requirements of the ASTM Standard Specifications for Aggregate for Masonry Mortar, Designation C144-76.
3. The grout shall be uniformly applied by means of damp (neither dripping wet nor dry) pads of burlap of convenient size (approximately 6 inches square) and shall be allowed to harden for one to two hours, depending on the weather. In hot, dry weather the surface shall be kept damp by means of a fine fog spray during the hardening period.
4. When the grout has hardened sufficiently, but before it becomes so hard as to be difficult to remove, excess grout shall be scraped from the surface of the parent concrete by the edge of a steel trowel, without removing the grout from the imperfections. Thereafter, the surface shall be allowed to dry thoroughly and then be rubbed vigorously with burlap to remove all dried grout so that no visible film remains on the surface after the rubbing. The entire cleaning operation for any area shall be so

planned that sufficient time is allowed for the grout to dry and be rubbed after it has been cut with the trowel.

5. On the day following the grouting and burlap rubbing, the concrete surface shall again be rubbed clean with a dry burlap to remove inadvertent dust. If any built-up film remains on the parent surface, it shall be removed by being rubbed with a fine abrasive stone without breaking through the surface film of the original concrete. Such rubbing shall be light and sufficient only to remove excess material without working up a lather of mortar or changing the texture of the concrete. Following the final rubbing with burlap or abrasive stone, the surface shall be thoroughly washed with stiff bristle brushes (worked only along parallel lines) to remove extraneous materials from the surface. The surface shall then be sprayed with a fine fog spray to maintain a continually damp condition for at least three (3) days after application of the grout.
6. When the burlap-rubbed finish has been completed, the concrete surface shall be smooth, free from discolorations and stains, and of uniformly good appearance.

3.13 HOT WEATHER CONDITIONS

Placing of concrete under conditions of high temperature, low humidity or wind shall be done in accordance with the American Concrete Institute "Hot Weather Conditions" (latest edition).

3.14 COLD WEATHER CONDITIONS

Cold weather concreting procedures precautions shall conform with American Concrete Institute "Cold Weather Concreting" (latest edition).

END OF SECTION 03 30 00

SECTION 05 50 00
MISCELLANEOUS METALS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following metal fabrications:
1. Miscellaneous structural steel framing and supports.
 - a. Applications where framing and supports are not specified in other sections.
 2. Miscellaneous steel trim.
 3. Steel bar gratings.
 4. Aluminum grating.
 5. Floor plate and supports.
 6. Guardrails and Handrails.
 7. Metal stairs.
 8. Anchorage to hardened concrete.
 9. Canopy & Frame

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

- A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.
1. Top Rail of Handrail Systems: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 pounds applied at any point nonconcurrently, vertically downward, or horizontally.
 - b. Uniform load of 100 pounds per linear foot applied vertically and concurrently with a uniform load of 50 lbs/ft applied horizontally.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 2. Handrails not serving as Top Rails: Capable of withstanding the following loads applied as indicated:

- a. Concentrated load of 200 pounds applied at any point nonconcurrently, vertically downward, or horizontally.
 - b. Uniform load of 50 pounds per linear foot applied nonconcurrently, vertically downward, or horizontally.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
3. Stair Treads: Capable of withstanding a uniform load of 100 pounds per square foot or a concentrated load of 300 pounds on an area of 4 square inches located in the center of the tread, whichever produces the greater stress.
 4. Stair platforms: Capable of withstanding a uniform load of 100 pounds per square foot.
 5. Floor Gratings & Platforms: Capable of withstanding a uniform load of 250 pounds per square foot or a concentrated load of 300 pounds per foot of grating width, whichever produces the greatest stress. No grating shall be installed which deflects more than ¼ inch under a uniform load of 100 pounds per square foot.
 6. Canopy & Frame: Capable of withstanding dead, live, snow, wind, and seismic load per ASCE/SEI 7-16. Design and fabricate per latest version of Aluminum Design Manual. Reference the Drawings for additional information and requirements.

1.5 SUBMITTALS

- A. General. Submit the following in accordance with Section 01 33 00, “Submittals”.
 - B. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
 - C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details, of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts designed for installation under other sections.
 1. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.
 - D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under “Quality Assurance” article.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications. Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 “Structural Welding Code – Steel,” D1.3 “Structural Welding Code – Sheet Steel,” and D1.2 “Structural Welding Code – Aluminum.”

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Engineer Qualifications. Professional engineer licensed to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

1.7 PROJECT CONDITIONS

- A. Field Measurements. Where possible, check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction project to avoid delay of work.
1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence and coordinate installation of wall handrails as follows:
1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Steel Plates, Angles and Bars. ASTM A36.
- C. Steel Shapes:
1. W Shapes ASTM A992
 2. C and S Shapes ASTM A36
- D. Rolled Steel Floor Plates. ASTM A 786.
- E. Steel Bars for Gratings. ASTM A 569 or ASTM A 36.
- F. Wire Rod for Grating Cross Bars. ASTM A 510.

- G. Cold-Formed Steel Tubing. ASTM A 500; Grade B, unless otherwise indicated or required for design loading.
- H. Galvanized Steel Sheet. ASTM A 653; Grade A, unless another grade required for design loading, and G90 coating designation unless otherwise indicated.
- I. Steel Pipe. ASTM A 53; finish, type, and weight class as follows:
 - 1. Galvanized finish for exterior installations and where indicated.
 - 2. Type S, Grade B, standard weight (Schedule 40), unless otherwise indicated, or another weight required by structural loads.
- J. Gray Iron Castings. ASTM A 48, Class 25 or better.
- K. Welding Rods and Bare Electrodes. Select in accordance with AWS specifications for the metal alloy to be welded.

2.2 STAINLESS STEEL

- A. Bar Stock and Shapes. ASTM A 276, Type 204 or 316.
- B. Plate. ASTM A 240, Type 204 or 316.
- C. Bolts and Nuts. ASTM F 593 and ASTM F 594, Type 304 or 316.

2.3 ALUMINUM

- A. Extruded Bars and Shapes. ASTM B 221, alloys as follows:
 - 1. 6061-T6 or 6063-T6 for bearing bars of gratings and shapes.
 - 2. 6061-T1 for grating cross bars.
- B. Fasteners for Aluminum: stainless steel.

2.4 GROUT

- A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- B. Available Products. Subject to compliance with requirements, non-shrink nonmetallic grouts that may be incorporated in the work include but are not limited to the following:
 - 1. “Bonsal Construction Grout”; W.R. Bonsal Co.
 - 2. “Diamond-Crete Grout”; Concrete Service Materials Co.
 - 3. “Euco N-S Grout”; Euclid Chemical Co.
 - 4. “Kemset”; Chem-Masters Corp.
 - 5. “Crystex”; L&M Construction Chemicals, Inc.
 - 6. “Masterflow 713”; Master Builders.
 - 7. “Sealtight 588 Grout”; W. R. Meadows, Inc.
 - 8. “SonogROUT”; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
 - 9. “Stonecrete NM1”; Stonhard, Inc.

10. “Five Star Grout”; U. S. Grout Corp.
11. “Vibropruf #11”; Lambert Corp.

2.5 FASTENERS

- A. General. Provide stainless steel fasteners unless otherwise indicated. Select fasteners for the type, grade, and class required.
- B. Connectors and Accessories
 1. High Strength Bolts: ASTM A 325.
 2. Unfinished Bolts: ASTM A 307, Grade B, cadmium plated.
 3. Self-Locking Nuts: Prevailing torque type; IFI-100, Grade A.
 4. Flat Washers: ANSI B 27.2.
 5. Lock Washers: Spring type, ANSI B 27.1.
 6. Beveled Washers: Table 1 of “Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts,” AISC Steel Construction Manual.
- C. Connection Requirements
 1. Make connections not specifically detailed on Drawings using Tables I and III, Framed Beam Connections, in the latest edition of the AISC manual. The shop fabricated portion of structural connections may be bolted, welded, or riveted. Except for connections detailed on the Drawings or specified otherwise, make all field connections with ASTM A 325 high-strength bolts.
 2. Connections for miscellaneous metal work not included in the AISC definition of structural steel may be made with unfinished bolts. All unfinished bolts shall be equipped with self-locking nuts or lock washers.
 3. Install high-strength bolts using turn-of-nut tightening as described in “Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts” as set forth in the AISC manual. Beveled washers shall be used when the bearing faces of bolted parts have a slope of 1:20 or greater with respect to a plane perpendicular to the bolt axis. Provide a platform or other means of access at each field connection until the connection has been inspected by the Engineer.
 4. Field welded connections will not be acceptable for structural steel unless shown on the Drawings or specifically permitted by the Engineer. Where structural or miscellaneous steel connections are welded, all butt and miter welds shall be continuous and where exposed to view shall be ground smooth. In addition, intermittent welds shall have an effective length of at least 2 inches and shall be spaced not more than 6 inches apart.
- D. OSHA Standards. Connections shown on the Drawing or as specified in this or related sections indicate the details pertinent to performance of the structure or assembly. When erection means and methods dictate installation of additional temporary bolts or additional temporary bracing in order to adhere to OSHA regulations, the additional bolts and bracing shall be at the expense of the Contractor. Additional bolts and bracing shall be removed when permissible in the erection process and damaged areas repaired unless permitted by the Engineer to remain in place.

2.6 PAINT AND GALVANIZING

- A. Steel members, fabrications, and assemblies shown to be galvanized after fabrication shall be treated as follows:

1. Hot dip galvanize in accordance with ASTM A 123.
2. Zinc used for galvanizing shall conform with ASTM B 6.
3. Weight of zinc coating to conform to requirements specified under “Weight of Coating” in ASTM A 123.
4. Safeguard against steel embrittlement in conformance with ASTM A 143.
5. Safeguard against warpage or distortion of steel members in conformance with ASTM A 384. Notify Engineer of potential warpage problems which may require modification in design before proceeding with fabrication or treating.
6. Finish and uniformity of zinc coating and adherence of coating to comply with ASTM A 123.
7. Give a passivating treatment to galvanized elements which are not to be further coated or which may be stored in open, exterior locations for long periods prior to erection. Do not use chromate passivation on items to be painted after erection.
8. Do not treat galvanized or passivated surfaces which are to be painted with oils or other chemicals which might interfere with coating adhesion.

B. Protection of Aluminum in Contact with Other Materials

1. Coat aluminum surfaces to be placed in contact with other metals, except stainless steel, or concrete with two coats of a high-build coal tar coating.
2. Coating to be Tnemec “46-465 H.B. Tnemecol,” Corchem Corporation “Corchem 146 High Build Coal Tar,” or approved equal.
3. Solvent clean and otherwise prepare all surfaces in accordance with the coating manufacturer’s recommendations prior to application.
4. Each coat to provide a dry film thickness of at least 10 mils.

2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.8 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

2.9 STEEL FRAMING AND SUPPORTS

- A. General. Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates,

and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches on center and provide minimum anchor units in the form of steel straps 1 ¼ inches wide x ¼ inch x 8 inches long.

2.10 STEEL GRATINGS

- A. General. Produce metal bar gratings of description indicated per metal bar grating standard “Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads” published in ANSI/NAAMM A202.1 “Metal Bar Grating Manual.”
- B. Fabricate welded steel and stainless steel gratings to comply with requirements indicated below:
 1. Mark/Size: Unless otherwise indicated on the Drawings, ANSI/NAAMM A202.1 “Metal Bar Grating Manual” Figure W-19-4 (welded with bearing bars 1-3/16 inch on center and cross bars 4 inches on center).
- C. Fabricate pressure-locked rectangular bar aluminum gratings to comply with requirements indicated below:
 1. Mark/Size: Unless otherwise indicated on the Drawings, ANSI/NAAMM A202.1 “Metal Bar Grating Manual” Figure P-19-4 (pressure-locked with bearing bars 1-3/16 inch on center and cross bars 4 inches on center)/ rectangular bearing bar sizes as indicated.
- D. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz. per sq. ft. of coated surface.
- E. 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.
- F. Fabricate cutouts in grating sections for penetrations indicated. Arrange layout of cutouts to permit grating removal without disturbing items penetrating gratings.
 1. Edge band openings in grating that interrupt two 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.
- G. Available Manufacturers. Subject to compliance with requirements, manufacturers offering metal bar gratings that may be incorporated in the Work include, but are not limited to, the following:
 1. Alabama Metal Industries Corp.
 2. Barnett/Bates Corp.
 3. Blaw-Knox Grating Div., Blaw-Knox Corp.
 4. IKG Industries.

5. Klemp Corp.
6. Ohio Gratings, Inc.
7. Reliance Steel Products, Inc.
8. Seidelhuber Metal Products, Inc.
9. Truweld, Inc.

2.11 ALUMINUM GRATING & STAIR TREAD

- A. Aluminum grating shall be fabricated of I-shaped bars, alloy 6063-T6, with swaged cross bars spaced on 4" centers. Bearing bars shall be spaced on 1 3/16" centers. Top surface of bearing bars shall be striated to provide a non-slip surface.
- B. Grating shall be designed to support a uniform load of 200 pounds per square foot with a maximum deflection of 1/4". The maximum fiber stress shall not exceed that which is allowed by the Aluminum Association.
- C. Standard installation clearances and tolerances shall conform to the requirements of the current Metal Bar Grating Manual published by the National Association of Architectural Metal Manufacturers.
- D. Aluminum frames embedded in concrete shall incorporate a recess under the horizontal bearing leg to receive the hold down fasteners. The frames shall be TF1.25A thru TF2.50A as manufactured by Thompson Fabricating, LLC (Birmingham, AL).
- E. Install aluminum clamps or clips to anchor the grating securely to supports. A minimum of 4 fasteners per panel shall be provided, unless otherwise shown on the drawings. All hardware shall be stainless steel.
- F. Cutouts for circular obstructions are to be at least 2" larger in the diameter than the obstruction. Cutouts for all piping 2" in diameter or less shall be made in the field. Band all ends of grating.
- G. Aluminum shelf angles shall be anchored to the concrete using stainless steel (type 18-8) wedge anchors.
- H. Aluminum stair treads shall be I-bar grating type with an extruded aluminum corrugated nosing.
- I. Paint all aluminum surfaces in contact with concrete or dissimilar metals with a shop coat of bituminous paint.

2.12 STEEL FLOOR PLATE

- A. Fabricate raised pattern steel floor plates from rolled steel plate 1/4-inch in thickness and in pattern as indicated; if not indicated, as selected from manufacturer's standard patterns.
- B. Include steel angle stiffeners and fixed removable sections as indicated.
 1. Provide two steel bar drop handles for lifting plates, one at each end of each removable section.

2.13 GUARDRAILS AND HANDRAILS

- A. Guardrails and Handrails shall be the product of a company normally engaged in the manufacture of pipe railing. Railing shall be shop assembled in lengths not to exceed 24 feet for field erection.
- B. The handrail shall be made of pipes joined together with component fittings. Samples of all components, bases, toeboard and pipe must be submitted for approval at the request of the engineer. Components that are pop-riveted or glued at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware. Handrail and components shall be TUFRAIL, as manufactured by Thompson Fabricating, LLC (Birmingham, AL) or an approved equal.
- C. Railings shall be 1 ½” Schedule 40 aluminum pipe alloy 6105-T5, ASTM-B-429 or ASTM-B-221. Post shall be 1 ½” Schedule 50 aluminum pipe of the same alloy. Post spacing shall be a maximum of 6’-0”.
- D. Guardrails and Handrails shall be designed to withstand a 200lb concentrated load applied in any direction and at any point on the top rail.
- E. Intermediate railings shall be provided such that a 21-inch diameter sphere cannot pass through any opening.
- F. The manufacturer shall submit calculations for approval at the request of the Engineer. Testing of base castings or base extrusions by an independent lab or manufacturer’s lab (if manufacturer’s lab meets the requirements of the Aluminum Association) will be an acceptable substitute for calculations. Calculations will be required for approval of all other design aspects.
- G. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by projected fittings.
- H. The mid-rail at a corner return shall be able to withstand a 200lb load without loosening. The manufacturer is to determine this dimension for their system and provide physical tests from a laboratory to confirm compliance.
- I. Concrete anchors shall be stainless steel type 303 or 304 wedge anchors and shall be furnished by the handrail manufacturer. The anchor design shall include the appropriate reduction factors for spacing and edge distances in accordance with the manufacturer’s published data.
- J. Toeboard shall conform to OSHA standards. Toeboard shall be a minimum of 4” high and shall be an extrusion that attaches to the posts with clamps which allow for expansion and contraction between posts. Toeboard shall be set ¼” above the walking surface. Toeboard shall be provided on handrails as required by OSHA and/or as shown on drawings. Toeboard shall be shipped in stock lengths for field installation.
- K. A self-closing gate shall guard openings in the railing (OSHA 1910.23). Safety chains shall not be used unless specifically shown on the drawings.
- L. Finish shall be Aluminum Association M10-C22-A41 (215-R1). The pipe shall be plastic-wrapped. The plastic wrap is to be removed after erection.

- M. Aluminum surfaces in contact with concrete, grout, or dissimilar metals will be protected with a coat of bituminous paint, Mylar isolators or other approved material.

2.14 STEEL FRAMED STAIRS

- A. General. Construct stairs to conform to sizes and arrangements indicated. Join pieces together by bolting, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.
 - 1. Fabricate treads and platforms of exterior stairs to accommodate slopes to drain in finished traffic surfaces.
- B. Stair Framing. Fabricate stringers of structural steel channels as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to strings, newels, and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.
- C. Floor Grating Treads and Platforms. Provide patterns, spacing, and bar sizes indicated; fabricate to comply with NAAMM "Metal Bar Grating Manual."
- D. Treads shall be aluminum and comply with the requirements specified elsewhere in this section for aluminum grating and treads. Fabricate grating treads with angle or plate carrier at each end for stringer connections. Secure treads to stringers with stainless steel bolts.
- E. Fabricate grating platforms with nosing matching that on aluminum grating treads at all landings. Provide toe plates at open-sided edges of grating platform. Secure grating to platform frame with stainless steel clips and bolts.
- F. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for pipe railings and handrails.

2.15 ANCHORAGE TO HARDENED CONCRETE

- A. Dowels or anchors placed in existing or hardened concrete shall be wedge type, stainless steel, ASTM F 593 and ASTM F 594, with threaded rod with hex nuts, unless shown otherwise.

2.16 CANOPY & FRAME

- A. Frame shall be extruded aluminum members connected via weld and/or stainless steel fasteners.
- B. Anchorage to concrete shall be designed by the manufacturer and utilize stainless steel anchors.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, 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.
- B. Center nosings on tread widths with noses flush with riser faces and tread surfaces.
- C. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 FABRICATION, GENERAL

- A. Form metal fabrications 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. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 100 F (55.5 C).
- D. Shear and punch metals cleanly and accurately. Remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to 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.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Shop Assembly: 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.
- K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

3.3 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement. Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication 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 that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld or bolt, as indicated, 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 which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Field Welding. Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, 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.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- F. Corrosion Protection. Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- G. Epoxy Anchors

1. Verify number, size, depth, and location of anchor or dowels to be installed.
2. Comply with temperature and moisture limitation as recommended by the manufacturer.
3. Drill holes in concrete to the depth specified on the Drawings using methods as instructed by the epoxy manufacturer. The diameter of holes shall be as instructed by the epoxy manufacturer for the anchor or dowel being installed. Clean holes as instructed by the epoxy manufacturer.
4. Install epoxy in strict accordance with the manufacturer's instructions using guns with self mixing nozzles provided by the manufacturer. Verify epoxy is mixed prior to placement into the hole using methods per manufacturer's instructions. Insert dowel or anchor into the hole and hold steady as instructed by the manufacturer.

3.4 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 1. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 INSTALLATION OF METAL BAR GRATINGS

- A. General. 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 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.

3.6 INSTALLATION OF GUARDRAILS AND HANDRAILS

- A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
 1. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-reactive setting cement, mixed and placed to comply with anchoring material manufacturer's directions.
 2. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:
 1. Use type of bracket with pre-drilled hole for exposed bolt anchorage.

2. For concrete and masonry anchorage, use stainless steel epoxy set anchors.

3.7 ADJUSTING AND CLEANING

A. Touch-Up Painting. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and recoat exposed areas.

END OF SECTION 05 50 00

DIVISION 09: FINISHES

SECTION 09 96 00

PAINT AND PROTECTIVE COATINGS FOR WATER & WASTEWATER FACILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. This specification covers preparation of surfaces, performance and completion of painting of all surfaces as required by the drawings and as specified herein.
- B. All Materials delivered to job site shall be in original sealed and labeled containers of the paint manufacture.

1.02 ENVIRONMENTAL CONDITIONS

- A. Coatings shall be applied during good painting weather. Air and surface temperatures shall be within limits prescribed by the manufacture for the coating being applied and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.

1.03 ENVIRONMENTAL REGULATIONS

- A. All materials specified herein meet the current VOC Regulations and National AIM Regulations in effect. Shop applied materials to meet current HAPS requirements.
- B. All products in contact with potable water must be certified by ANSI/NSF to Standard 61.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials specified herein are manufactured by the TNEMEC Co., Inc., North Kansas City, Missouri (615-333-1000). These products are specified to establish standards of quality and are approved for use on this project.
- B. Equivalent materials of other manufacturers may be substituted on approval of the engineer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information and evidence of satisfactory past performance. Submittals shall include the following performance data as certified by a qualified testing laboratory:

ASTM B117 - Method of Salt Spray (Fog) Testing

ASTM D149 - Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials of Commercial Power Frequencies

ASTM D3359 - Method for Measuring Adhesion by Test Tape
ASTM D3363 - Method for Film Hardness by Pencil Test
ASTM D4060 - Method for Abrasion Resistance of Organic coatings by the Taber Abraser
ASTM D4541 - Method for Pull-Off Strength of Coats Using Portable Adhesion Testers
ASTM 4585 - Practice for Testing the Water Resistance of Coatings Using Controlled Condensation
ASTM G53 - Practice for Operating Light- and Water- Exposure of nonmetallic Materials
AWWA D102 - Standard for Painting Steel Water Storage Tanks
SSPC-SP6 - Commercial Blast Cleaning
SSPC-SP10 - Near White Blast Cleaning

- C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the engineer at least ten (10) days prior to the bid opening. Substitutions which decrease the film thickness, the number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.
- D. Colors, where not specified, shall be as selected by the engineer. All colors shall be certified lead free.
- E. Materials supplied by other manufacturers may be considered for substitution if the following prevailing conditions exist:
1. Performance criteria of the specified materials are exceeded by the submitted alternate materials as listed in paragraph 2.01 and detailed on the technical data sheets of each specified product.
 2. The submittal must compare the performance criteria of the specified material with that of the submitted material and be documented in a side by side manner for the Engineer\Owner to review.
 3. Substitute materials must be for complete systems and not individual products combined with the specified materials and the performance criteria for all products within a system must meet or exceed the specified materials.
 4. Only one alternate submittal will be received for this specification and must be accompanied by a detailed statement of the sum to be added or deducted from the base bid should alternate materials be accepted.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Materials shall be mixed, thinned and applied according to the manufacturer's printed instructions and in accordance with AWWA D 102-11.

3.02 SURFACE PREPARATION

- A. Prepare surfaces in accordance with coating system's specifications. Touch up welds, burned and abraded areas with specified primer before applying field coats.
- B. Allow each coat to dry thoroughly before applying next coat.
- C. Finish coats shall be uniform in color and sheen without streaks, laps, runs, sags or missed areas. Primer and finish coats shall be furnished from the same Manufacturer to ensure compatibility.

3.03 ACCEPTANCE OF WORK

- A. All Surface Preparation and repairs shall be approved by the engineer/owner before primer is applied.
- B. Request acceptance of each coat before applying next coat.
- C. Correct work that is not acceptable and request re-inspection.

3.04 SYSTEM INSPECTION AND TESTING

- A. After application of each coating in the specified system and its surface has cured, measure its thickness with a properly calibrated Nordson Microtest Dry Film Thickness Gauge, or equivalent. Follow standard method for measurement of dry paint thickness with magnetic gauges as outlined in Society of Protective Coatings Specification SSPC-PA2
- B. Make as many determinations as needed to ensure the specified thickness values in each typical area. To all surfaces having less dry film thickness than specified, apply additional coat(s) at no extra cost to Owner to bring thickness up to specifications.
- C. Structural metals in immersion service that receive a protective coating system shall be checked with a non-destructive holiday detector that shall not exceed 67 1/2 volts. All pinholes or defects shall be repaired in accordance with manufacturer's printed recommendations and then retested.
- D. Masonry, drywall, or other non-metallic surfaces shall be continuously checked with wet-film thickness gauges during application to ensure proper dry film thickness will be attained. Also, square feet coverage needs to be monitored to verify proper coverage rates.

- E Painting contractor shall permit Owner's Representative and/or paint & coating manufacturer (as requested by owner) to inspect his work for conformance to this specification. Owner reserves the right to reject all work that does not comply with this specification.

3.05 CLEANUP

- A. Remove and dispose of all rubbish or other unsightly material, in a legal manner, leaving the premises in a clean condition.

3.06 PAINTING SCHEDULE

- A. Steel - Structural, Tanks, Pipes and Equipment
1. Exterior, Non-Immersion
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: 1074\1075-Color Endura-Shield at 2.0 - 3.0 mils DFT.
 2. Immersion, Potable or Non-Potable Water
Surface Preparation: SSPC-SP10 Near-White Blast Cleaning.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
* Use Series N140 Pota-Pox Plus in Potable Water
 3. Severe Vapor Phase and Liquid Fluctuation Level, Non-Potable water with high levels of Hydrogen Sulfide.
Surface Preparation: SSPC-SP5/NACE 1 White Blast Cleaning.
1st Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
2nd Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
* May be applied in one coat at 30.0 to 40.0 mils DFT
 4. Immersion or Hydrogen Sulfide Exposure
Surface Preparation: SSPC-SP5/NACE 1 White Blast Cleaning.
1st Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.
2nd Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.
 5. Interior, Non-Immersion
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
 6. Metal Anchorage for Buried Piping
Surface Preparation: Shop Primed Materials - Clean and Dry or SSPC-SP3 Power Tool Clean.
1st Coat: 46-465 H.B. Tnemecol at 8.0 -12.0 mils DFT.
 7. Miscellaneous Castings, Including Manhole Rings and Covers
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
1st Coat: 46H-413 Hi-Build Tneme-Tar at 12.0 - 16.0 mils DFT.
 8. Factory Primed
Surface Preparation: Surface shall be clean and dry.
Shop Primer: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
Barrier Coat as Required: 1-1216 Omnithane at 2.5 to 3.5 mils DFT.

Finish Coat: See top coat for exposure. System 3.06 A 1, or 5.

B. Galvanized Metal

1. Exterior, Non-Immersion
Surface Preparation: Prepare in accordance with ASTM D6386.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 2.0 - 3.0 mils DFT.
2nd Coat: 1074\1075-Color Endura-Shield at 2.0 - 3.0 mils DFT.
2. Interior, Non-Immersion
Surface Preparation: Prepare in accordance with ASTM D6386.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 2.0 - 3.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 2.0 - 3.0 mils DFT.
3. Immersion
Surface Preparation: Prepare in accordance with ASTM D6386.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 2.0 - 3.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 2.0 - 3.0 mils DFT.
* Use Series N140 Pota-Pox Plus in Potable Water

C. Mill Coated Steel Pipe

1. Exterior of Pipe, Non-Immersion
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
Surface shall be clean and dry, remove black coating.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT
2nd Coat: 1074\1075-Color Endura-Shield at 2.0 -3.0 mils DFT.
2. Immersion, Potable or Non-Potable Water
Surface Preparation: SSPC-SP10 Near-White Blast Cleaning.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
* Use Series N140 Pota-Pox Plus in Potable Water

D. Ductile or Cast Iron: Pipe and Miscellaneous Fabrications

1. Exterior, Non-Immersion
Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
1st Coat: N(L)69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: 1074/1075-Color Endura Shield at 2.0 - 3.0 mils DFT.
2. Interior, Non-Immersion
Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
One Coat: N(L)69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
3. Immersion, Potable or Non-Potable Water
Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
* Use Series N140 Pota-Pox Plus in Potable Water
4. Severe Vapor Phase and Liquid Fluctuation Level, Non-Potable water with high levels of Hydrogen Sulfide.

Surface Preparation: NAPF 500-03.

1st Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.

2nd Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.

* May be applied in one coat at 30.0 to 40.0 mils DFT

5. Immersion or Hydrogen Sulfide Exposure

Surface Preparation: NAPF 500-03.

1st Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.

2nd Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.

6. Below Ground

Surface Preparation: Contact Tnemec Representative

Primer: (Optional) Series N69 Hi-Build Epoxoline, 3.0 to 5.0 mils DFT

Finish Coat: Series 46H-413 Hi-Build Tneme-Tar, 14.0 to 20.0 mils DFT

E. Concrete, Dense Masonry

1. Exterior, Non-Immersion

Surface Preparation: Surface shall be clean and dry.

One Coat: 180/181-Color W.B Tneme-Crete at 6.0 - 8.0 mils DFT.

2. Interior

Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.

1st Coat: 84-Color Ceramlon ENV at 6.0 - 8.0 mils DFT .

2nd Coat: 84-Color Ceramlon ENV at 6.0 - 8.0 mils DFT.

3. Interior, exposed to high levels of Hydrogen Sulfide and Sulfuric Acid Condensate.

Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP 5 or greater

Surfacer: 218 MortarClad (215 Epoxy Surfacer as required).

1st Coat (as required): 434 Perma-Shield H2S at 125 mils DFT

2nd Coat: 435 Perma-Glaze at 30.0 – 40.0 mils DFT. Or: 436 Perma-Shield FR at 50.0 to 125.0 mild DFT

4. Fluoride Room, Floor & Walls

Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP 5 or greater .

1st Coat: 120-5002 Vinester (*) at 12.0 - 18.0 mils DFT.

2nd Coat: 120-5001 Vinester at 12.0 -18.0 mils DFT.

*Use 215 Epoxy Surfacer to fill bug holes and voids flush.

5. Chemical Storage, Containment Areas (Floor, Trench, Tank Pad, and 3'6" Band on Walls).

Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP 5 or greater

1st Coat: 201 Epoxoprime applied at 6.0 - 8.0 mils DFT

2nd Coat: 275-Color Stranlok at 25.0 - 40.0 mils DFT.

3rd Coat: 282-Color Tneme-Glaze at 6.0 - 8.0 mils DFT.

6. Immersion or Non-Immersion, Dense Masonry – Clearwell, wetwells and secondary containment
 Surface Preparation: Pressure Blast to achieve an open Capillary substrate.
 1st Coat: Apply XYPEX Concentrate at 1.5 pounds per square yard.
 2nd Coat: Apply XYPEX Modified at 1.5 pounds per square yard.
 Admix C-1000 may be used at the batch plant as an admix.
7. Interior, pipe gallery walls - Clear:
 Surface Preparation: Rub seams and irregular areas
 1st Coat: Chemprobe Series 660 Prima-A-Pell 200.
 2nd Coat: Chemprobe Series 660 Prima-A-Pell 200.
8. Interior: pipe gallery walls - Colored
 Surface Preparation: Surface shall be clean and dry.
 1st Coat: 84-Color Ceramlon ENV at 6.0 – 8.0 mils DFT
 2nd Coat: 84-Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
9. Immersion: Potable or Non-Potable Water
 Surface Preparation: Brush-Off Blast.
 Filler Coat (As Required): Fill flush all bug holes and voids with TNEMEC 215 Epoxy Surfacer.
 1st Coat: 104-Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
 2nd Coat: 104-Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
 * Use Series N140 Pota-Pox Plus in Potable Water

E. Porous Masonry - CMU

1. Exterior
 Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
 1st Coat: 156-Color Enviro-Crete at 6.0 - 8.0 mils DFT.
 2nd Coat: 156-Color Enviro-Crete at 6.0 - 8.0 mils DFT.
 Note: Split face block requires TNEMEC 130 Envirofill.
2. Interior
 Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
 1st Coat: 84-Color Ceramlon ENV at 80- 100 sq. ft. gal.
 2nd Coat: 84-Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
3. Exterior: Clear Sealer and/or Stain
 Surface Preparation: Surface to be sound, dry and free of cracks, oils efflorescence, paint or other contaminates.
 Sealer Coat: Apply TNEMEC Prima-Pell H₂O at 125 to 150 Sq. ft./gal.

F. Concrete Floors

1. Interior
 - a. Pipe Gallery, Mechanical Rooms - Clear
 Surface Preparation: See Product Data Sheet
 2 coats: 629 CT Densifyer 201 at 300 to 350 sq. ft. per gallon.
 - b. Pipe Gallery, Mechanical Rooms – Colored
 Surface Preparation: Acid Etch or Brush-Off Blast. ICRI CSP 1-3

1st Coat: 205-ColorTerra-Tread FC at 3.0 - 5.0 mils DFT.
2nd Coat: 205-ColorTerra-Tread FC at 3.0 - 5.0 mils DFT.
3rd Coat (As Required): 290/291-Color CRU at 1.0 – 2.0 mils DFT. Non-skid with 211 Glass beads.

- c. Decorative - Lab area, Shower and Bathroom areas
Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP 3 – 5.
1st Coat: 201 Epoxoprime at 6.0 - 8.0 mils DFT.
2nd Coat: 222-Color DECO-Tread at 1/16 inch (Double seed)
3rd Coat: 284 DECO-Clear seal coat(s).

G. Concrete Structures.

- 1. Below Grade
Surface Preparation: Brush-off Blast.
One Coat: 46H-413 Hi-Build Tneme-Tar at 12.0 - 16.0 mils DFT.

H. Plaster and Wallboard

- 1. Interior
Surface Preparation: Surface shall be clean and dry.
1st Coat: Series 51 PVA Sealer DFT 1.0 - 2.0 mils.
2nd Coat: 113-Color H.B. Tneme-Tufcoat at 4.0 - 6.0 mils DFT.
- 2. Interior – Heavy Abuse
Primer: Series 201 Epoxoprime, DFT 6.0 to 8.0 mils
Intermediate: Series 270 Stranlok, DFT 25.0 to 40.0 or 273 Stranlok ML, DFT 20.0 to 25.0 mils with reinforcing mat
Finish: Series 280 Tneme-Glaze, DFT 6.0 to 8.0 mils

I. Wood

- 1. Interior or Exterior
Surface Preparation: Surface shall be clean and dry
1st Coat: 10-99W Tnemec Primer at 2.0 - 3.0 mils DFT.
2nd Coat: TNEMEC 1028/1029-Color ENDURATONE® at 2.0 - 3.0 mils DFT.
3rd. Coat: TNEMEC 1028/1029-Color ENDURATONE® at 2.0 - 3.0 mils DFT.

J. Insulated Pipe

- 1. Interior
Surface Preparation: Surface shall be clean and dry
1st Coat: 6-Color Tneme-Cryl at 2.0 - 3.0 mils DFT.
2nd Coat: 1028/1029-Color Tneme-Cryl at 2.0 - 3.0 mils DFT.

K. PVC Pipe

- 1. Interior
Surface Preparation: Surface shall be lightly sanded and be clean and dry.
One Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.

L. Non-Ferrous Metals

1. Interior

Surface Preparation: SSPC-SP1 Solvent Cleaning and lightly scarify.
One Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.

2. Exterior

Surface Preparation: SSPC-SP1 Solvent Cleaning and lightly scarify.
1st Coat: N(L)69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: 1074/1075-Color Endura Shield at 2.0 – 3.0- mils DFT.

M. Brick

1. Exterior Sealer

Surface Preparation: Surface to be sound, dry and free of cracks, oils, efflorescence, paint or other contaminants.

Sealer Coat.: Apply TNEMEC Prima-Pell H₂O at 125 to 150 Sq. ft./gal

3.06 COLOR CODE FOR PROCESSING EQUIPMENT

1. Prior to beginning work verify colors for new equipment with Owner.

System - OSHA:

	GENERIC COLOR	COLOR IDENTIFICATION
WATER		
Raw Water	olive green	110GN Clover
Settled or Clarified Water	aqua	10GN Aqua Sky
Finished or Potable Water	Dark Blue	11SF Safety Blue
Reclaimed Water	Purple	16SF Rec Water Purple
WASTEWATER		
Sewage Plant Effluent	day*	07RD Terra Cotta
Backwash Waste	light brown	68BR Twine
Sludge	dark brown	84BR Weathered Bark
Sewer (Sanitary or Other)	dark gray	34GR Deep Space
CHEMICAL		
Alum or Primary Coagulant	orange	04SF Safety Orange
Ammonia	white	11WH White
Carbon Slurry	black	35GR Black
Caustic	yellow with green band	02SF Safety Yellow with 09SF Safety Green
Chlorine (Gas and Solution)	yellow	02SF Safety Yellow
Fluoride	light blue with red band	25BL Fountain blue with 06SF Safety Red
Lime Slurry	light green	37GN Irish Spring

	GENERIC COLOR	COLOR IDENTIFICATION
Ozone	yellow with orange band	02SF Safety Yellow with 04SF Safety Orange
Phosphate Compounds	light green with red band	37GN Irish Spring with 06SF Safety Red
Polymers or Coagulant Aids	orange with green band	04SF Safety Orange with 09SF Safety Green
Potassium Permanganate	violet	14SF Safety Purple
Soda Ash	light green with orange band	37GN Irish Spring with 04SF Safety Orange
Sulfuric Acid	yellow with red band	02SF Safety Yellow with 06SF Safety Red
Sulfur Dioxide	light green with yellow band	37GN Irish Spring with 02SF Safety Yellow

OTHER		
Compressed Air	dark green	91GN Balsam
Gas Tile	red	28RD Monterrey
Other Lines	light gray	32GR Light Gray
Hoists/trolleys	yellow*	02SF Safety Yellow
Fire Protection	red*	06SF Safety Red

* These generic colors are not part of the Recommended Standards for Water Works.

END OF SECTION

DIVISION 22: PLUMBING

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Valve tags.
 - 5. Warning tags.
 - 6. NFPA Warning Signs.

1.3 REFERENCES:

- A. Applicable Standards (Latest Edition):
 - 1. ASME International (ASME):
 - a. ASME A13.1 - Scheme for the Identification of Piping Systems.
 - 2. National Fire Protection Association (NFPA)
 - a. NFPA 704 - Standard System for the Identification of the Hazards of Materials for Emergency Response

1.4 ACTION SUBMITTALS:

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.5 COORDINATION:

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS:

- A. Select labels from options listed below.
 - 1. Metal Labels for Equipment:
 - a. Material and Thickness: Brass, 0.032-inch (0.8-mm), Stainless steel, 0.025-inch (0.64-mm), Aluminum, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - b. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

- c. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - d. Fasteners: Stainless-steel self-tapping screws.
 - e. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
 - 2. Plastic Labels for Equipment:
 - a. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
 - 3. Letter Color: Black.
 - 4. Background Color: White.
 - 5. Maximum Temperature: Able to withstand temperatures up to 160°F (71°C).
 - 6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - 7. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 8. Fasteners: Adhesive or as required to mount on equipment.
 - 9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
 - B. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Exception: For labels in Fluoride feed and storage areas, select plastic labels only
 - 2. Data:
 - a. Manufacturer, product name, model number, and serial number.
 - b. Capacity, operating and power characteristics, and essential data.
 - c. Labels of tested compliances.
 - C. Equipment Tags: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.
 - 2. Data: Equipment number (see Schedules on Drawings).
 - D. Location: Accessible and visible.
- 2.2 WARNING SIGNS AND LABELS:
- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
 - B. Letter Color: White.
 - C. Background Color: Red.
 - D. Maximum Temperature: Able to withstand temperatures up to 160°F (71°C).
 - E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - F. Minimum Letter Size: 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - G. Fasteners: Stainless-steel rivets or self-tapping screws.
 - H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
 - I. Label Content: Include caution and warning information, plus emergency notification

instructions.

2.3 PIPE LABELS:

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
- D. Identify piping with legend and arrows as specified below:
 - 1. Valves, flanges and pipe direction change.
 - 2. Both sides ceiling, floor or wall penetration.
 - 3. Every line entry point.
 - 4. Every 50 feet of pipe run.
 - 5. Direction of flow arrows at end of each label.
 - 6. Pipe & Letter Sizes:
 - a. Less than 1/4" pipe: 1/2" lettering
 - b. 1 1/2" – 2": 3/4"
 - c. 2 1/2" – 6": 1 1/4"
 - d. 8" – 10": 2 1/2"
 - e. Greater than 10" pipe: 3 1/2" lettering

2.4 VALVE TAGS:

- A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers, with numbering scheme approved by Owner.
 - 1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2 by 11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS:

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches (100 by 178 mm).
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Yellow background with black lettering.
- B. NFPA Warning Signs.
 - 1. Provide warning signs in accordance with NFPA 704 at all exterior and interior doorways of buildings, storage areas and at each chemical storage tank. Warning signs shall reflect all chemicals stored or used within the area.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

- 3.2 EQUIPMENT LABEL INSTALLATION:
- A. Install or permanently fasten labels on each major item of mechanical equipment.
 - B. Locate equipment labels where accessible and visible.
- 3.3 PIPE LABEL INSTALLATION:
- A. Locate pipe labels as stated below and where piping is exposed; machine rooms; accessible maintenance spaces and exterior exposed locations as follows:
 - 1. Near each valve, control devices and pipe direction changes.
 - 2. Every line entry point.
 - 3. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 4. Both sides, penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 5. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 6. Near major equipment items and other points of origination and termination.
 - 7. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 - B. Pipe Label Color Schedule: Comply DIVISION 09 Paint and Protective Coatings, or if not indicated, comply with ASME A13.1.
- 3.4 VALVE-TAG INSTALLATION:
- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
 - B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches (38 mm) round or square shape.
 - b. Hot Water: 1-1/2 inches (38 mm) round or square shape.
 - c. Tepid Water: 1-1/2 inches (38 mm) round or square shape.
 - 2. Valve-Tag Color:
 - a. In accordance with DIVISION 09 Paint and Protective Coatings, or if not indicated, comply with ASME A13.1.
 - 3. Letter Color:
 - a. In accordance with DIVISION 09 Paint and Protective Coatings, or if not indicated, comply with ASME A13.1.
- 3.5 WARNING-TAG INSTALLATION:
- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 22 05 55

SECTION 26 05 00
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of this section and all following Division 26, Electrical Specifications.

1.2 SCOPE

- A. Furnish all labor, materials, equipment and services necessary for and reasonably incidental to the complete installation of all electrical as shown on the drawings and as specified herein to result in a finished and operating facility.
- B. Principal features of the installation are as follows:
 - 1. A complete system of conduit and conductors to supply electrical energy throughout the pump station and site.
 - 2. Service entrance, branch panelboards, wiring devices, etc.
 - 3. Lighting fixtures and lamps.
 - 4. Wiring in connection with pump equipment.
 - 5. Outside lighting and control.
 - 6. Control systems.
 - 7. Underground system installation.
 - 8. Connection of equipment.
 - 9. Demolition of existing electrical systems.
 - 10. Emergency power distribution system provisions.
 - 11. SCADA system wiring.

1.3 CODES AND STANDARDS

- A. The entire electrical installation shall be made in strict accordance with the requirements of any and all City, County, State or Federal codes of Law having jurisdiction, the requirements and recommendations of the Board of Fire Underwriters, including all amendments and/or additions to the said codes, laws, requirements, and recommendations, the requirements and recommendations of the local utility, and the Southern Standard Building Code Congress International, Inc. Standard Codes.

- B. Should any work shown on the drawings or herein specified be construed as being contrary to or not conforming to the previously mentioned codes, laws, etc., the same shall be brought to the attention of the Engineer to be reviewed, approved, and/or corrected prior to final bid date.
- C. Should any work shown on the drawings or herein specified be more rigid as to requirements than the requirements of the various codes, the drawings and specifications shall be followed in executing the work.
- D. The Contractor shall file with proper authorities all necessary drawings as required by various codes, laws, ordinances and/or other requirements.
- E. Permits, inspections and fees: The Contractor shall obtain all permits and inspections required for the work, and shall pay all costs and fees thereof including the Power Company's contribution to construction costs.

1.4 RELATED PROJECT DOCUMENTS

- A. The complete set of project documents contain requirements that relate to the electrical construction work specified by the Division 26 electrical specifications and illustrated by the electrical design drawings. All project documents shall be referenced and conformed with for the required electrical installation work. Each specification section or subsection relates to all other sections or subsections. No specification section may be used as stand alone requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical construction products of types required for this project whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with not less than 5 years of successful experience in installation of products similar to those required for this project.
- C. UL Compliance: Comply with applicable portions of UL safety standards pertaining to electrical equipment and installation required for this project.
- D. NEC Compliance: Comply with NEC and NESC as applicable to installation of equipment required for this project.
- E. Comply with all current work safety rules and regulations.

PART 2 - GENERAL ELECTRICAL REQUIREMENTS

2.1 REQUIREMENTS

- A. Drawings indicate the general character, scope, and arrangements of the electrical installation. Approval of any change or departure from the drawings must be obtained from the Engineer.
- B. Equal Products: Those items on the drawings or in these specifications designating particular product numbers limit their use only as to design, workmanship and quality, not manufacturer. Approval for alternate or substitute items shall be secured from the Engineer, and submittals for approval must be accompanied by all necessary descriptions, catalog sheets, etc. Authority over such submittals shall rest with the Engineer.
- C. Workmanship: All work shall be performed by skilled workmen in a manner reflecting the best modern construction practices. It shall present, upon completion, a neat, orderly, finished appearance. All evidence of debris associated with the work shall be removed from the premises. All work shall conform to all OSHA workplace requirements.
- D. Coordination with other trades to the fullest of ability in relation with others to result in a professional installation shall be complete, and more specifically, as follows:
 - 1. The drawings and specifications are based on the best information available when prepared. Frequently minor changes occur with respect to the architectural plans, constructions, and the requirements of equipment furnished by others. The electrical contractor shall recognize this in bidding, supervising, and in planning construction.
 - 2. Before locating conduit runs, boxes, etc., the drawings shall be carefully checked to see that they are in accord with the electrical drawings. Required adjustments shall be made with the General Contractor's superintendent and with the Engineer.
 - 3. Before proceeding with the wiring for mechanical and equipment trades, each item requiring electrical work shall be reviewed with those responsible for their installation. The electrical contractor shall become well acquainted with their characteristics, location and arrangement for mounting. Changes in wiring arrangements and other adjustments, necessary or desirable, shall be reviewed with the Engineer for authorization. This applies also to all equipment for which wiring is required, such as HVAC units, water heating, pumps, thermostats, motors, pushbuttons, limit switches, fire protection systems, shop equipment, etc., as they occur.
- E. Allowances for Contingencies: No change in contract price will be allowed for alternate work which requires approximately the same work to adjust or relocate electrical components or devices as part of the construction coordination work. An adequate

allowance shall be included in the bid price for such coordination contingencies and for the additional work required by these coordination adjustments.

- F. Allowances for Contingencies: No change in contract price will be allowed for alternate work which requires approximately the same work to adjust or relocate electrical components or devices as part of the construction coordination work. An adequate allowance shall be included in the bid price for such coordination contingencies and for the additional work required by these coordination adjustments.
- G. Coordinate the proposed locations of major raceway systems, equipment, and materials. Include the following:
 - 1. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance. Comply with code requirements for working space about electrical equipment.
 - 2. Coordinate installation of required supporting devices and set sleeve in cast-in-place concrete, masonry, walls, and other structural components as they are constructed.
 - 3. Equipment connections and support details.
 - 4. Sizes and locations of required concrete pads and bases.
 - 5. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 - 6. Penetrations in floors, walls and ceilings, and their relationship to other penetrations and installations.
- H. Materials shall be new and unused, and shall bear the Underwriter's Seal where applicable.
- I. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- J. Retain two sets of all equipment or device installation instructions and submit to the Engineer prior to project completion.

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements

of the actual equipment to be connected. Refer to individual equipment shop drawings prior to rough-in installation work.

- B. Refer to equipment specifications in Divisions 2 through 26 and the complete project drawing set for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

- A. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment.
- B. Coordinate electrical systems, equipment, and materials installation with other building components.
- C. Verify all dimensions by field measurements.
- D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
- E. 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.
- F. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- G. Where mounting heights are detailed or dimensioned, install systems, materials, and equipment to provide the maximum amount of headroom possible.
- H. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- I. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
- J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
- K. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for

ease of disconnecting, with minimum of interference with other installations.

- L. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors **2 inches** above finished floor level.
- F. Size pipe sleeves to provide **1/4-inch** annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- H. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- I. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and

make watertight seal.

3.5 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section “CUTTING AND PATCHING.” In addition to the requirements specified in Division 1, the following requirements apply:
1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - a. Uncover Work to provide for installation of ill-timed Work.
 - b. Remove and replace defective work.
 - c. Remove and replace work not conforming to the requirements of the Contract Documents.
 - d. Remove samples of installed work as specified for testing.
 - e. Install equipment and materials in existing structures.
 - f. Upon written instructions from the Engineer, uncover and restore Work to provide for Engineer observation of concealed Work.
 2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
 3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Patch existing finished and disturbed new finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required or the surface and building components being patched.

3.6 TEST AND GUARANTEES

- A. The Contractor shall perform, prior to final acceptance, an operations test to all electrical equipment. The entire installation shall be free from grounds and short circuits. Before the Owner operates the equipment for the first time, the Contractor shall furnish a person familiar with the equipment to instruct and assist the Owner's personnel in the proper operation and maintenance of said equipment.
- B. Warranty-Guarantee: The electrical contractor shall warrant and the General Contractor shall guarantee that all work executed under this Division of the specifications will be free from defects in materials and workmanship for a period of one year from the date of final acceptance of the building. The above parties agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the warranty-guarantee.

3.7 PROTECTION OF MATERIALS

- A. All work, fixtures, and materials shall be protected at all times. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemical, or mechanical injury. At final completion, all work shall be thoroughly cleaned and delivered in an unblemished condition.
- B. The Contractor shall defer the installation of all electrical fixtures liable to damage until authorized by the Engineer. After fixtures are permanently installed, they shall be completely protected against breaking, damage, or the depositing of any waste or materials therein or thereon until the system is accepted.
- C. Touch up all damaged painted surfaces on equipment to match original paint.

3.8 SHOP DRAWING AND MAINTENANCE MANUALS

- A. Submit shop drawings in accordance with Division 1 requirements, shop drawings and wiring diagrams for the following:
 - 1. Panelboards
 - 2. Pump Control Panels
 - 3. Manual transfer switches
- B. Materials and Equipment Submittals: Furnish catalog sheets or cuts for all items above, and submit catalog data of the following:
 - 1. Lighting fixtures

2. Panelboards
 3. Wiring devices
 4. Control devices
 5. Disconnect switches
 6. Variable Frequency Drives
 7. Conduit systems
 8. Communication wiring
 9. Distribution system wiring
- C. Furnish all equipment submittals in one package to Engineer for approval. All partial submittals will be rejected, or will be held unchecked until submittals are complete.
- D. Maintenance Manuals: Upon completion of the work, deliver to the Engineer for the Owner's use, two copies each of complete operation and maintenance instructions and data for the electrical equipment furnished under the electrical contract work. Data shall include catalog pages or data sheets for each piece of equipment, wiring diagrams showing the internal and external elements and their connections, manufacturer's maintenance manuals, bills of materials showing necessary data for ordering repair parts, and approved shop drawings. This information shall be furnished for the following systems and items.
1. Pump Control Panel
 2. Panelboards
 3. Manual transfer switches

3.10 WORK IN CONNECTION WITH EQUIPMENT FURNISHED BY OTHERS

- A. Mechanical: Furnish and install all necessary wiring for the supply and control of all mechanical work, including plumbing, heating, air conditioning, and ventilation. Furnish and install disconnect switches for motors where required by the codes. The contractor shall make provisions for variations in the mechanical equipment and make connections as required by the actual equipment furnished.
- B. Motor wiring:
1. Services to equipment shall be checked out against that required by the equipment prior to service connection. Should the equipment require service different to that provided, the contractor shall call that fact to the attention of the Engineer prior to connection of the service. Check equipment to determine whether proper control and safety devices are provided to insure proper operation. Assist Owner in the initial operation of the equipment, and make any necessary adjustments to the service for proper operation.
 2. Motor and Motor Controls: Where required, the manual motor starters shall be

suitable for the application, Square D Co., Type F, K, M or T with proper overload protection, mounted in an appropriate box with a 120-volt pilot light. Disconnect switches shall be the heavy-duty type with "Dual Element" fuses, with an enclosure suitable for the application. Provide accessories necessary for the application.

3. Equipment shall be controlled by manual and automatic systems as required by the control documents, shown on the drawings and specified in this section of the specifications.
4. Air Conditioning and Heating Equipment: All air conditioning and heating equipment shall have fused disconnect switches or breakers installed at the unit. These switches or breakers shall be sized and be of the type as it appears on the label of the equipment.
5. Install and connect all package control equipment and control devices furnished under other divisions of these specifications including all interconnecting control wiring.

C. Work in Connection with Motors:

1. Rotation: All motors shall be checked for proper rotation just as soon as power is available. Should any motor rotate in the wrong direction, it shall be re-connected for proper operation.
2. Overload Heaters: Check all motor starters overload heater elements for the proper size to conform to the name plate rating of the motor. Should an improper size unit be installed, the attention of the Engineer and the starter supplier shall be called to that fact.
3. Connection: The raceway connection to the individual motors shall be by means of a short length of flexible conduit. All pump motors shall be connected with type "UA" liquid tight flexible conduit. Connectors used with liquid tight flexible conduit shall be of a type made for the purpose and that will establish a continuous ground. All motors and all controls therewith shall be connected up completely as required for proper operation of the system involved.

D. Owner Furnished: Furnish power wiring and connections to all equipment furnished by others and shown on the plans.

3.11 TEMPORARY WIRING

- A. As soon as practicable after the roof is closed over, install temporary wiring and lighting throughout the building as specified in Division 1. Temporary wire may, if acceptable to

the local code authority, consist of plastic type non-metallic sheathed cable having a ground wire to which all the receptacle ground poles shall be connected. The installation of the temporary wiring shall comply with the current codes and rulings of the local inspector. All breakers serving receptacle outlets shall have ground fault protection.

- B. In renovation construction, maintain the existing lighting and power systems as required for temporary power or provide temporary wiring and lighting in accordance with (A.) above.

END OF SECTION 26 05 00

SECTION 26 05 19 WIRES AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of electrical wire and electrical cable work is indicated by drawings and schedules.
- B. Types of wire, cable and connectors in this section include, but are not limited to, the following and requirements of the service application:
 - 1. Copper conductors
 - 2. Fixture wires
 - 3. Switchboard wires
 - 4. Tap type connectors
 - 5. Split-bolt connectors
- C. Applications for wire, cable and connectors required for project are as follows:
 - 1. Power distribution circuitry
 - 2. Lighting circuitry
 - 3. Appliance and equipment circuitry
 - 4. Motor-branch circuitry
 - 5. Control circuitry
- D. All wire and cable shall conform to the latest requirements of the NEC and shall meet all ASTM/UL specifications. Wire and cable shall be new; shall have size, grade of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at regular intervals. Complete descriptive literature shall be submitted to the Engineer for review and acceptance prior to installation.
- E. Building wire #12 - #1 shall be applied based on 60 degree Celsius temperature rise. Building wire larger than #1 may be applied at its 75 degree Celsius temperature rise.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to,

the following:

1. Wire and Cable:
 - a. Advance Wire and Cable, Inc.
 - b. General Cable Corp.
 - c. Rome Cable Corp.
 - d. Southwire

2. Connectors:
 - a. AMP, Inc.
 - b. Burndy Corp.
 - c. Ideal Industries, Inc.

2.2 WIRE, CABLE, AND CONNECTORS

- A. General: Except as otherwise indicated, provide wire, cable and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, and as required for the installation.

- B. Wire: Provide factory-fabricated copper conductor, wire of sizes, ratings, materials, and types indicated for each service. Where type is not indicated, provide proper selection as determined by Installer to comply with project's installation requirements and NEC standards.

- C. Connectors: Provide factory-fabricated, metal connectors of sizes, ratings, materials, types and classes as indicated for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and NEC standards. All wiring nuts shall be twist-on type. Non-twist-on type wire nuts shall not be allowed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install electrical cables, wires and connectors as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.

- B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.

- C. Pull conductors together where more than one is being installed in a raceway.
- D. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.
- E. Use pulling means, including fish tape, cable or rope which cannot damage raceway.
- F. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members and follow surface contours, where possible.
- G. Keep conductor splices to a minimum.
- H. Install splices and taps which have mechanical strength. Current and insulation rating shall be equivalent-or-better than conductor. All splices shall be compression type with 3M cold shrink and taped.
- I. Use splice and tap connectors which are compatible with conductor material.
- J. Identify and color-code conductors and cable according to Division 26 Section "Electrical Identification."
- K. Wiring at Outlets: Install conductors at each outlet with at least 6 inches of slack.
- L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeves for installing mechanical sleeve seals.
- M. Install to seal underground exterior-wall penetrations.
- N. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.2 FIELD QUALITY CONTROL

- A. Prior to energization, test cable and wire for continuity of circuitry, and also for short circuits. Correct malfunctions when detected.
- B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.
- C. Use THHN/THWN stranded for all field motor and control work. Use solid copper only for building branch wiring circuits at size No. 12 and No. 10. All other wiring shall be class and type approved for the applications. Minimum conductor size shall be AWG

number 12 except branch circuits in excess of 75 feet from panel to first outlet not smaller than No. 10 AWG.

D. Control cable:

1. Control cable shall be the size and have the number of conductors shown on the control system drawings. Control cable shall be used for motor controls and monitoring only. Color coding shall be ICEA, Method 1. Control cables between buildings shall be underground in conduit of the size shown in the control system schematic. Cabling shall provide a minimum of 25 percent spare conductors. Voltage rating shall be 600 volts.

E. Instrument cable:

1. All signal lines should be constructed of individually twisted pairs (6 to 10 twists per foot), including thermocouple extension leads. Cables should be made of twisted pairs, with all lays and pairs twisted in the same direction for maximum flexibility.
2. Wire size #16 AWG minimum for single pair runs under 5,000 feet in length. Wire size shall be #16 AWG for multi-pair cable runs under 5,000 feet in length.
3. Stranded tinned copper conductor shall be used for all wiring other than thermocouple extension leads.
4. Insulation resistance at 68 degrees Fahrenheit between conductors and between conductors and ground should be at least 500 megohms per 1,000 feet.
5. Multi-pair cable should be jacketed with poly-vinyl-chloride, polyethylene or Teflon at least 0.045" thick. Voltage rating shall be 600 volts. Cable shall be rated for wet location underground use.

F. Signal wiring

1. Low level analog (less than 500 millivolt d-c). Use twisted pairs which may be cabled with other pairs carrying similar voltage levels. Foil wraps or equivalent shielding is required for each cable with the shield insulated from ground.
2. High level analog (greater than 500 millivolts d-c). Use twisted pairs which may be cabled with other pairs carrying similar voltage levels and current levels less than 100 ma. Shielding is required.
3. Analog outputs (normally 0-4-d-c or 4-20 ma) - same as 1.
4. Contact inputs - use twisted pairs and run in separate conduit.

5. Contact outputs - same as 4.
 6. Pulse inputs - same as 4.
- G. Signal and shield grounding:
1. All shields must be grounded at one point only as close as possible to the signal source.
 2. Thermocouples may be grounded or ungrounded.
 3. Analog signals, if grounded, should be grounded as near the signal source as possible.
 4. Resistance bulbs should not be grounded.
- H. Signal and wiring separation:
1. High level analog signals may share the same conduit or run with contact or pulse signals.
 2. Thermocouple and low level signals should be run in a separate conduit.
 3. A minimum separation of 12 inches between analog signal leads and a-c power leads should be maintained. For a-c power leads carrying 100 amps or greater, a 24 inch separation should be maintained. Parallel runs should be limited to less than 500 feet. Perpendicular runs may be as close as 6 inches.

END OF SECTION 26 05 19

SECTION 26 05 20
ELECTRICAL CONNECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electric connections are hereby defined to include, but not necessarily limited to, connections for providing electrical power to equipment, control wiring connections, communication connections.
- B. Types of electrical power and electrical system connections specified in this section includes, but is not limited to the following:
 - 1. To motors
 - 2. To equipment
 - 3. To motor starters
 - 4. To motor control equipment
 - 5. From motor starters to motors
 - 6. To lighting fixtures
 - 7. To transformers, inverters, rheostats, and similar current adjustment features of equipment
 - 8. To ground
 - 9. To master units of communication, signal and alarm
- C. Motor starters and controls not furnished integrally with equipment are specified in applicable Electrical work sections along with installation specifications.
- D. Refer to other specifications sections for motor starters and controls furnished with equipment; not work of this section.
- E. Junction boxes and disconnect switches required for motors and other electrical units of equipment are specified in applicable Electrical work sections.
- F. Refer to other specifications sections and the drawings for control system wiring work described and installed under Electrical work.
- G. Refer to specification sections and plans of other work Divisions for specific individual equipment power requirements.
- H. Furnish all labor and material and making power connections to all electric equipment

furnished under the Architectural, Plumbing, Heating, Air Conditioning and equipment sections of the specifications and plans.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. AMP Products Corp.
2. Appleton Electric Co.
3. Burndy Corp.
4. Ideal Industries, Inc.
5. T and B - Thomas and Betts Corp.

2.2 MATERIALS AND COMPONENTS

- A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices and terminations of types indicated.
- B. Metal Conduit, Tubing and Fittings: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements; comply with NEC requirements for raceways. Provide products complying with Electrical Work basic materials and methods section "Raceways", and in accordance with the raceway material required for the project.
- C. Wire, Cable, and Connectors: Provide wires, cables, and connectors complying with Electrical Work basic materials and methods section "Wires and Cables".
- D. Wire: Unless otherwise indicated, provide wires/conductors for electrical connections which match wires/conductors of wiring supplying power.
- E. Connectors and Terminals: Provide electrical connectors and terminals as recommended by connector and terminal manufacturer for intended applications.
- F. Electrical Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, solder, electrical soldering flux, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated. Only

twist-on type wire nuts will be permitted for branch circuit wiring.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS

- A. Install electrical connections as indicated; in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Wherever possible, mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
- C. Coordinate installation of electrical connections for equipment with equipment installation work.
- D. Cover splices with electrical insulation equivalent to, or of higher rating, than insulation on conductors being spliced.
- E. Prepare cables and wires by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated.
- F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- G. Tighten wire-binding connector screws firmly.
- H. Provide flexible conduit for motor connections, and for other electrical equipment connections where subject to movement and vibration.
- I. Provide liquid-tight metallic flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration, and also where subjected to one or more of the following conditions:
 - 1. Exterior location
 - 2. Moist or humid atmosphere where condensate can be expected to accumulate
 - 3. Corrosive atmosphere
 - 4. Subjected to water spray
 - 5. Subjected to dripping oil, grease, or water
- J. Refer to basic materials and methods section for identification of electrical power supply

conductor terminations with markers approved as to types, colors, letter and marker sizes, by Engineer. Affix markers at each point of termination, as close as possible to each point of connection.

END OF SECTION 26 05 20

SECTION 26 05 24 SUPPORTING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of supports, anchors, sleeves and seals is indicated by drawings and schedules and/or specified in other Electrical work sections.
- B. Types of supports, anchors, sleeves and seals specified in this section include but are not limited to the following:
 - 1. Clevis hangers
 - 2. Riser clamps
 - 3. C-clamps
 - 4. I-beam clamps
 - 5. One-hole conduit straps
 - 6. Two-hole conduit straps
 - 7. Round steel rods
 - 8. Lead expansion anchors
 - 9. Toggle bolts
 - 10. Wall and floor seals
- C. Furnish and install supports, anchors, sleeves and seals for factory-fabricated equipment as required to properly and securely mount the equipment.
- E. Furnish and install supports, braces, anchors and fasteners to meet seismic code requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

- A. General: Provide supporting devices; complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. Where more than one type of device meets indicated requirements, selection is Installer's option. All support devices and hardware shall be 304 Stainless Steel.
- B. Supports: Provide supporting devices of types, sizes and materials indicated; and having the following construction features:

1. Clevis Hangers: For supporting 2" rigid metal conduit; stainless steel; with 1/2" dia. hole for round steel rod; approx. 54 pounds per 100 units.
 2. Riser Clamps: For supporting 5" rigid metal conduit; stainless steel; with 2 bolts and nuts, and 4" ears; approx. 510 pounds per 100 units.
 3. Reducing Couplings: Steel rod reducing coupling, 1/2" X 5/8"; stainless steel; approx. 16 pounds per 100 units.
 4. C-Clamps: Black malleable iron; 1/2" rod size; approx. 70 pounds per 100 units.
 5. I-Beam Clamps: 1-1/4" X 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.
- C. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; stainless steel; approx. 7 pounds per 100 units.
1. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, stainless steel; 3/4" strap width; and 2-1/8" between center of screw holes.
 2. Hexagon Nuts: For 1/2" rod size; stainless steel; approx. 4 pounds per 100 units.
 3. Round Steel Rod: Stainless steel; 1/2" dia.; approx. 67 pounds per 100 feet.
 4. Offset Conduit Clamps: For supporting 2" rigid metal conduit; approx. 200 pounds per 100 units.
- D. Anchors: Provide anchors of types, sizes and materials indicated; and having the following construction features:
1. Lead Expansion Anchors: 1/2"; approx. 38 pounds per 100 units.
 2. Toggle Bolts: Springhead; 3/16" X 4"; approx. 5 pounds per 100 units.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated in the work include, but are not limited to, the following:
1. Ackerman Johnson Fastening Systems, Inc.
 2. Ideal Industries, Inc.
 3. Star Expansion Co.
 4. U.S. Expansion Bolt Co.
- F. Sleeves and Seals: Provide sleeves and seals, of types, sizes and materials indicated; and having the following construction features:

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws. Floor sleeves and seals shall match the fire rating of the assembly being penetrated.
- G. Conduit Cable Supports: Provide cable supports with insulating wedging plug for non-armored type electrical cables in risers; construct for 2" rigid metal conduit; 3-wires, type wire as indicated; construct body of malleable iron casting with hot dip galvanized finish.
- H. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 16-gauge 304 stainless steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, and with the following fittings which mate and match with U-channel:
 1. Fixture hangers
 2. Channel hangers
 3. End caps
 4. Beam clamps
 5. Wiring stud
 6. Thinwall conduit clamps
 7. Rigid conduit clamps
 8. Conduit hangers
 9. U-bolts
- I. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co., Inc.
 2. Midland-Ross Corp.
 3. Unistrut Div; GTE Products Corp.
- J. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

2.2 FABRICATED SUPPORTING DEVICES

- A. Pipe Sleeves: Provide pipe sleeves, suitable for the application, of one of the following:

1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge.
 2. Steel-Pipe: Fabricate from schedule 40 galvanized steel pipe; remove burrs.
 3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
- B. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
1. Lead and Oakum: Caulked between sleeve and pipe.
- C. Fire Barriers: Provide galvanized steel conduit sleeves through all fire wall, floor ceiling or barrier penetration. Seal sleeve with an approved expanding fire/smoke material. The wall penetration and seal assembly shall equal the fire rating of the barrier penetrated. Refer to Architectural plans for the location and type of fire barrier construction.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

- A. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC, MSS, and ANSI/NEMA for installation of supporting devices.
- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with maximum spacings indicated.
- D. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.
- E. Install all supporting devices to meet seismic requirements.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Beam clamps complying with MSS SP
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than **4 inches (100 mm)** larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use **3000-psi**, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3.
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and support. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Division 9 painting sections for cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 24

SECTION 26 05 26.1
GROUNDING AND GROUND-FAULT PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of grounding and ground-fault protection work is as directed by the NEC and additional grounding as indicated by the contract documents.
- B. Types of grounding and ground-fault protection in this section include but are not limited to the following:
 - 1. Grounding:
 - a. Underground metal piping
 - b. Underground metal water piping
 - c. Underground metal structures
 - d. Grounding electrodes
 - e. Grounding rods
 - f. Separately derived systems
 - g. Service equipment
 - h. Enclosures
 - i. Systems
 - j. Equipment
 - 2. Ground-Fault Protection
 - a. Ground-fault circuit interrupters
 - b. Ground-fault sensing and relaying equipment
- C. Provide an equipment grounding conductor in all feeder wiring runs. Provide ground bus in all panels, switchboards and equipment enclosures. Bond ground conductor in all metallic enclosures.
- D. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 GROUNDING

- A. Materials and Components: Except as otherwise indicated, provide each electrical

grounding system indicated, with assembly of materials including, but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, and other items and accessories needed for complete installation. Where more than one type meets indicated requirements, selection is Installer's option. Where materials or components are otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

- B. Equipment Grounding Conductor: Where specified or required by the application, provide code size equipment grounding conductors throughout the raceway system. Bond the equipment grounding conductor at all metal enclosures, equipment frames, housings, racks, etc. entered.
- C. Electrical Bonding Jumpers:
 - 1. Bonding Jumper Braid: Copper braided tape, constructed of 30-gauge bare copper wires and properly sized for indicated applications.
 - 2. Flexible Jumper Strap: Flexible flat conductor, 480 strands of 30-gauge bare copper wire; 3/4" wide, 9/1-2" long; 48,250 CM. Protect braid with copper bolt hole ends with holes sized for 3/8" dia. bolts.
- D. Electrical Grounding Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.
- E. Ground rods: Steel with copper welded exterior, 3/4" dia. X 10 feet long.
- F. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches, 12 inches in cross section, unless otherwise indicated; with insulators.
- G. Electrical Grounding Connections Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, thermoweld process, bonding straps, as recommended by accessories manufacturers for type services indicated.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUND-FAULT PROTECTION DEVICES

- A. General: Except as otherwise indicated, provide ground-fault protection devices and components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for applications indicated.
- B. Circuit Interrupters/Circuit-Breakers: Provide where required 1" wide module bolt-on panel board circuit breakers, with integral ground-fault circuit interrupters, UL-rated Class A, Group 1; 20-amperes ratings, 1-pole construction, 120-volts, 60 Hz, 22000 AIC. Provide with solid-state ground-fault sensing and signaling, with 5 milliamperes ground-fault sensitivity, plus or minus 1 milliampere. Equip with PUSH-TO-TEST capability. Provide modules which fit panelboards in which they are located.
- C. Ground-fault Sensing and Relaying Equipment: Provide ground-fault sensing and relaying equipment for 480 V, 60 Hz, grounded system consisting of current sensor to encircle and monitor circuit's phase and neutral conductors, relaying equipment to provide desired ground-fault current sensitivity and time-current response characteristics, monitor panel, and low voltage power circuit-breaker, equipped to function in conjunction with other elements of GFP system, and constructed with the following features:
 - 1. Current Sensors: Provide zero sequence current sensors for feeder and branch devices and ground return sensors for main service device; inputs compatible to relay. Construct sensor frame so it can be opened to permit removal or installation around conductors without disturbing conductors. Provide test winding in sensor for testing operation of GFP unit including sensor pick-up, relay, and circuit protection device operation.
 - 2. Ground-Fault Relay: Provide solid-state ground-fault relay, which requires no external source of electrical power, drawing energy to operate GFP system directly from output of current sensor. Construct with adjustable pick-up current sensitivity for GF currents from 200 to 1200 amperes, with calibrated dial to show pick-up point settings. Provide factory-set time delay of 0.5 seconds and which precludes tampering with setting after installation.
 - 3. Circuit Breaker: Provide molded case circuit breaker of ratings indicated. Construct with thermal and magnetic elements for conventional overload and fault current protection; and with GF trip mechanism capable of being activated by GF relay causing opening of circuit when ground fault of required magnitude occurs.
 - 4. Monitor Panel: Provide monitor panel capable of indicating relay operation, and

provide means for testing system with or without interruption of service.
Construct so GF system can not be left in an inactive or OFF state. Provide indicator lamps and TEST and RETEST control switches.

- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ground-fault sensing and relaying equipment which may be incorporated in the work include, but are not limited to, the following:
1. General Electric co.
 2. Siemens
 3. Pringle Electrical Mfg Co.
 4. Square D Co.

PART 3 - EXECUTION

3.1 INSTALLATION OF GROUNDING AND GROUND-FAULT PROTECTION SYSTEMS

- A. Install electrical grounding systems and ground-fault protection devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding and ground-fault protection devices comply with requirements. Comply with requirements of NEC, NESC, and NEMA standards for installation of grounding and ground-fault protection systems and devices. Provide ground fault system where code required.
- B. Coordinate with other electrical work as necessary to interface installation of grounding system and ground-fault protection devices with other work.
- C. Weld cable connections to ground rods and coat with protective asphaltic paint.
- D. Install braided type bonding jumpers with ground clamps on water meter piping to electrically bypass water meter.
- E. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- F. Install ground-fault protection devices complying with electrical winding polarities indicated.
- G. Fasten ground-fault sensing devices without mechanical stresses, twisting or misalignment being exerted by clamps, supports, bus bars or cables.
- H. Install ground-fault sensing windows symmetrically around power conductor bus bars or cable. Maintain clearances between conductors and ground-fault sensor body recommended by device manufacturer.

- I. Set field-adjustable GFP devices for pickup and time sensitivity ranges as indicated, after installation of devices.
- J. Where indicated on the drawings, provide additional isolated ground system. Isolated ground systems shall provide electrical isolation from outlet or device continuous to service equipment neutral/ground bonding point.

3.2 APPLICATIONS

A. Conductors:

- 1. Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Grounding bus:

- 1. Install in electrical and control equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
- 2. Install bus on insulated spacers 1 inch minimum, from wall **6 inches** above finished floor, unless otherwise indicated.

C. Conductor terminators 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.
- 4. Connections to Structural Steel: Welded connectors.

3.3 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.
7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

3.4 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 Rods: Drive rods until tops are 2 inches (50 mm) 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.
- C. 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 so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

- D. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- E. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each indicated item, extending around the perimeter of each new building or structure.
1. Install copper conductor not less than No. 4/0 AWG for ground ring and for taps to building steel.
 2. Bury ground ring not less than 24 inches from building foundation.
 3. Bond all handrails on concrete structures with minimum #2 copper.
 4. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of **20 feet** of bare copper conductor not smaller than No. **4** AWG.
 5. If concrete foundation is less than **20 feet** long, coil excess conductor within base of foundation.

3.5 FIELD QUALITY CONTROL

- A. Upon completion of installation of ground-fault protection devices and after electrical circuitry has been energized, demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- B. Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 3 ohms,

take appropriate action to reduce resistance to 3 ohms or less by driving additional ground rods. Then retest to demonstrate compliance.

- C. Perform resistance-to-ground tests of electrical grounding system one year following time of substantial completion and submit written report indicating results. Where resistance is greater than 3 ohms, chemically treat soil to reduce resistance to 3 ohms or less. Then retest to demonstrate compliance.

3.6 PERSONNEL TRAINING

- A. Building Maintenance Personnel Training: Train Owner's building maintenance personnel in procedures for testing and determining resistance-to-ground values for grounding system. Also instruct maintenance personnel in preparation and application of chemical solution for earth surrounding grounding rods for reducing ohmic resistance to required levels.

END OF SECTION 26 05 26.1

SECTION 26 05 33.13
RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of raceways is indicated by drawings and application. Provide raceway as required by the application. All exposed conduit shall be rigid galvanized steel. Use schedule 40 PVC under slab or encased. Provide a code size grounding conductor in all nonmetallic conduit. Install an insulated code size grounding conductor in all metallic raceway systems and connect/bond to all electrical system boxes, enclosures, frames and device grounds. Connect this conductor to all equipment frames, metallic boxes, device frames and other metallic components of the electrical distribution and utilization systems.

- B. Types of raceways in this section include the following:
 - 1. Liquid-tight flexible metal conduit
 - 2. Rigid Aluminum conduit
 - 3. Rigid nonmetallic conduit
 - 4. Electrical nonmetallic tubing

PART 2 - PRODUCTS

2.1 METAL AND NONMETALLIC CONDUIT AND TUBING

- A. General: Provide metal and nonmetallic conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with fire codes and applicable portions of NEC for raceways.

- B. Provide connectors, fittings, accessories and installation tools suitable for the product and application.

- C. Install conduit systems complying with manufacturers' published product information.

- D. Minimum conduit system shall be rigid galvanized steel except as otherwise noted.

- E. Minimum conduit shall be 3/4 inch.

2.2 WIREWAYS

- A. General: Provide electrical raceways of types, grades, sizes, weights (wall thicknesses), number of channels, for each type service indicated. Provide complete assembly of raceway including, but not necessarily limited to, couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other components and accessories as needed for complete system. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements, and comply with applicable provisions of NEC for electrical raceways.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL RACEWAYS

- A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and complying with recognized industry practices.
- B. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components with other work.
- C. Level and square raceway runs, and install at proper elevations/heights.
- D. Complete installation of electrical raceways before starting installation of cables/wires within raceways.
- E. Install flexible conduit for motor connections, and for other electrical equipment connections where subject to movement and vibration.
- F. Install liquid-tight flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration, and also where subjected to one or more of the following conditions:
 - 1. Exterior location
 - 2. Moist or humid atmosphere where condensate can be expected to accumulate
 - 3. Subjected to water spray
 - 4. Subjected to dripping oil, grease, or water
- G. Wherever possible, install horizontal raceway runs above water and steam piping.
- H. Provide secure fastening and support of conduit systems from the building structural system using materials manufactured for the intended application.
- I. Provide surface metal raceways where surface mounted applications is required in

existing buildings, particularly for light switches and receptacle installations.

- J. Support conduit runs in accordance to seismic code requirements.
- K. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid galvanized steel conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
- L. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

3.2 INSTALLATION

- A. Keep raceways at least **6 inches (150 mm)** away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Install temporary closures to prevent foreign matter from entering raceways.
- D. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- E. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- F. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- G. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least **2 inches (50 mm)** of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than **1-inch trade size (DN 27)** parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to rigid aluminum conduit before rising above the floor.

- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- N. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-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 at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70 such as Classified Hazardous locations.
- O. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid aluminum; FMC may be used 6 inches (150 mm) above the floor. Install

screwdriver-operated, threaded plugs flush with floor for future equipment connections.

- P. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures. Use LFMC in damp or wet locations for equipment subject to vibration, noise transmission, or movement; and for all motors.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by manufacturer.

END OF SECTION 26 05 33.13

SECTION 26 05 33.16
ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of electrical box and electrical fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings in this section include, but are not limited to, the following and the requirements of the application:
 - 1. Outlet boxes
 - 2. Junction boxes
 - 3. Pull boxes
 - 4. Conduit bodies
 - 5. Bushings
 - 6. Locknuts
 - 7. Knockout closures
 - 8. Outdoor handholes
 - 9. Outdoor manholes

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS

- A. Outlet Boxes: Provide FS type outlet boxes and accessories where rigid galvanized conduits are used. All exterior pull boxes and junction boxes shall be NEMA4XSS with continuous hinged 3-point latching closure. Provide explosion proof boxes in classified locations per NFPA 70.
- B. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is Installer's option.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering interior outlet boxes which may be incorporated in the work include, but are not limited to, the following:
 - 1. Appleton Electric Co.

2. Crouse-Hinds Co.
 3. RACO, Inc.
 4. Steel City/Midland-Ross Corp.
- D. Conduit Bodies: Provide galvanized cast-metal threaded conduit bodies, of type, shapes and sizes, to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering conduit bodies which may be incorporated in the work include, but are not limited to, the following:
1. Appleton Electric Co.
 2. Crouse-Hinds Co.
 3. Thomas & Betts Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

- A. General: Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
- C. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- D. Install boxes and conduit bodies in those locations to ensure ready accessibility of electrical wiring.
- E. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.
- F. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embedded electrical boxes in concrete or masonry.
- G. Provide electrical connections for installed boxes.
- H. Use cast metal outlets and device boxes for all exposed work outside.

- I. Ground all metallic junction boxes by bonding to the system raceway grounding conductor. Ground the yoke or frame of all box mounted devices.

END OF SECTION 26 05 33.16

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent and type of electrical identification are indicated herein and as follows:

1. Operational instructions and warnings
2. Danger signs
3. Equipment/system identification signs
4. Conduit identification
5. Power and control wiring identification
6. Terminal marking

1.2 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 AND ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFT 1910.145.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification products which may be incorporated in the work include, but are not limited to, the following:

1. W. H. Brady Co.
2. Ideal Industries, Inc.
3. Seton Name Plate Co.

2.2 ELECTRICAL IDENTIFICATION MATERIALS

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

- B. Cable/Conductor Identification Bands: Provide manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type; either prenumbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identification. Provide markers for all field control wiring.
- C. Self-Adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings; of sizes suitable for application areas and adequate for visibility, with proper wording for each application (as examples: 208V, EXHAUST FAN).
 - 1. Colors: unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
 - 2. Mark the identification of all disconnect switches.
- D. Engraved Plastic-Laminate Signs: Provide engraving stock melamine plastic Laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Mark all panelboard and equipment panels.
- E. Thickness: 1/16", for units up to 20 sq. in. or 8" length; 1/8" for larger units.
- F. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.3 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and working as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

2.4 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
 - 1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick
 - 2. Compounded for permanent direct-burial service
 - 3. Embedded continuous metallic strip or core
 - 4. Printed legend shall indicate type of underground line

2.5 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4 mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1 mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4 mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: “DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES.”
 - 2. Workspace Clearance Warning: “WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM).”

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

- A. General installation requirements:
 - 1. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
 - 2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
 - 3. Conduit Identification: Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by a color-coded method, apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use orange as coded color for conduit.
 - 4. Equipment/System Identifications: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master

unit of each electrical system including communication/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work.

- a. panelboards, electrical cabinets and enclosures, motor control centers
 - b. access panel/doors to electrical facilities
 - c. transformers
 - d. control stations
 - e. motor disconnects
 - f. telephone and communications switching equipment
5. Power-Circuit Conductor Identification: For primary and secondary conductors No. 6 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
 6. Branch-Circuit Conductor and Receptacles Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use write-on tags. Identify each ungrounded conductor according to source and circuit number.
 7. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
 8. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
 - a. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - b. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - c. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
 9. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

10. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - a. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - (1) power transfer switches
 - (2) controls with external control power connections
 - b. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
 11. Instruction signs:
 - a. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
 - b. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum **3/8-inch- (10-mm-)** high letters for emergency instructions at equipment used for power transfer.
- B. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrate.

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at **50-foot (15-m)** maximum intervals in straight runs, and at **25-foot (7.6-m)** maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors
1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
 2. Colors for 208/120-V Circuits:
 - a. phase A: black
 - b. phase B: red
 - c. phase C: blue
 3. Colors for 480/277-V Circuits:
 - a. phase A: brown
 - b. phase B: orange
 - c. phase C: yellow
 4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of **6 inches (150 mm)** from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at **6 to 8 inches (150 to 200 mm)** below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds **16 inches (400 mm)** overall.

END OF SECTION 26 05 53

SECTION 26 05 73 COORDINATION STUDY

1.1 DESCRIPTION

- A. The Contractor shall have a short circuit and coordination study prepared for the project documents provided for this project to verify that the existing equipment and new equipment is properly rated, will function correctly, and that the electrical system and personnel are properly protected. The incident energy study shall include all electrical distribution equipment shown on the one-line diagram including emergency distribution systems shown.
- B. The study shall present an organized time-current analysis of each protective device in series from the individual device back to the source. The study shall reflect the operation of each device during normal and any abnormal current conditions which could result in maximum fault conditions.

1.2 SUBMITTALS

- A. Three copies of the Power Systems Study shall be submitted.

1.3 QUALIFICATIONS

- A. The contractor shall have the coordination study prepared by qualified engineers of an independent consultant. The consultant shall be a Registered Professional Engineer who specializes in studies for protective device coordination and fault current calculations. The contractor is responsible for providing all pertinent information required by the preparers to complete the study.
- B. The short circuit and coordination study shall be performed using recognized electrical analysis software which meets the calculation requirements of ANSI C37, IEEE Std. 399 and IEEE 242.

1.4 REQUIREMENTS

- A. The complete study shall include a system one-line diagram, short circuit and ground fault analysis, and protective coordination plots.
- B. One-line diagram (s):
 - 1. Show on the one line diagram the following specific information:
 - a. Calculated fault impedance, X/R ratios, and short circuit values at the

- utility connection and the switchgear main bus
 - b. Breaker and fuse ratings
 - c. Transformer X/R ratios and wiring connections
 - d. Feeder length and X/R ratios
 - e. Short circuit study
- 2. The short circuit and associated coordination study shall include the utility system feed data as well as the following sections of the distribution system. The entire electrical distribution system shown on the feeder diagrams down to a level below 10,000 AIC.
 - a. Systematically calculate the fault impedance to determine the available short circuit and ground fault currents at each bus. Incorporate the motor contribution in determining the momentary and interrupting ratings of the protective devices.
 - b. The study shall be calculated by means of a digital computer. Pertinent data and the rationale employed in developing the calculations shall be incorporated in the introductory remarks of the study. Calculation methods shall meet the requirements of IEEE Std. 399 and ANSI C37.
 - c. Present the data determined by the short circuit study in a table format. Include the following:
 - (1) device identification
 - (2) operating voltage
 - (3) protective device
 - (4) device rating
 - (5) calculated short circuit current
- 3. Coordination curves:
 - a. Prepare the coordination curves to determine the required settings of protective devices to assure selective coordination. Graphically illustrate on log-log paper, that adequate time separation exists between series devices, including the utility company upstream device where applicable. Plot the specific time-current characteristics of each protective device in such a manner that all applicable upstream devices will be clearly depicted in one sheet.
 - b. The following specific information shall also be shown on the coordination curves:
 - (1) device identification
 - (2) voltage and current ratios for curves

- (3) 3-phase and 1-phase ANSI damage points for transformer directly fed from the switchgear
 - (4) minimum melt and total clearing curves for fuses
 - (5) cable damage curves
 - (6) transformer inrush points including total connected kVA inrush for feeder circuits
 - (7) maximum short circuit cutoff point
 - (8) a coordination one-line diagram of the feeder breaker under study
4. Develop a table to summarize the settings selected for each protective device. Include in the table, the following:
- a. device identification and breaker or load control
 - b. relay CT ratios and electronic set point equivalents for relay tap, time dial, and instantaneous pickup points
 - c. circuit breaker sensor rating
 - d. fuse rating and type
 - e. ground fault pickup and time delay
5. Incident Energy Study: an incident energy study shall be done in accordance with the IEEE 1584-2004a, "IEEE Guide for Performing Arc Flash Hazard Calculations", as referenced in NFPA 70, "Standard for Electrical Safety in the Workplace", 2004 Revision, in order to quantify the hazard for selection of personal protective equipment (PPE). Tables that assume fault current levels and clearing time for proper PPE selection are not acceptable.

1.5 ANALYSIS

- A. Analyze the short circuit calculations, and highlight any equipment that is determined to be underrated as specified.
- B. Propose approaches to effectively protect the underrated equipment.
- C. Provide minor modifications to conform with the study. (Examples of minor modifications are, trip sizes within the same frame, the time curve characteristics of induction relays, CT ranges, etc.)
- D. After developing the coordination curves, highlight areas lacking coordination.
- E. Present a technical evaluation with a discussion of the logical compromises for best coordination.

1.6 LABELS

A. Based on the results of the incident energy study, the supplier shall produce and install a warning label (**orange** <40 cal/cm²) or danger label (**red** > 40 cal/cm²) for each piece of equipment as specified in “Section A” in accordance with ANSI Z535.4-2002. The label must be readable in both indoor and outdoor environments for at least 3 years and contain the following information:

1. Arc hazard boundary (inches)
2. Working distance (inches)
3. Arc flash incident energy at the working distance (calories/cm²)
4. PPE category and description including the glove rating
5. Voltage rating of the equipment
6. Limited approach distance (inches)
7. Restricted approach distance (inches)
8. Prohibited approach distance (inches)
9. Equipment/bus name
10. Date prepared
11. Supplier name and address

1.6 FINAL REPORT

A. The results of the power system study shall be summarized in a final report. The report shall include the following sections:

1. Introduction, executive summary, recommendations, and assumptions
2. Tabulations of equipment ratings versus calculated short circuit values and X/R ratios
3. Protective device time versus coordination curves, tabulations of relay and circuit breaker trip settings and fuse selection
4. Engineering analysis, commentary and recommendations
5. Incident energy level (calories/cm²) for each equipment location and recommended PPE

END OF SECTION 26 05 73

SECTION 26 22 00 TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of transformer work is indicated by drawings and schedules.
- B. Types of transformers specified in this section include the following:
 - 1. Dry-type transformers

1.2 QUALITY ASSURANCE

- A. NEC Compliance: Comply with NEC as applicable to installation and construction of electrical power/distribution transformers.
- B. NEMA Compliance: Comply with applicable portions of NEMA Std Pub Nos. TR 1 and TR 27 pertaining to power/distribution transformers.
- C. ANSI Compliance: Comply with applicable ANSI standards pertaining to power/distribution transformers.
- D. ANSI/IEEE Compliance: Comply with applicable ANSI/IEEE standards pertaining to power/distribution transformers.
- E. ANSI/NEMA Compliance: Comply with NEMA Std ST 20; "Dry-Type Transformers for General Applications".
- F. ANSI/UL Compliance: Comply with applicable portions of ANSI/UL 506; "Safety Standard for Specialty Transformers".
- G. UL Labels: Provide distribution transformers which have been UL-listed and labelled.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data including rated KVA, frequency, primary and secondary voltages, percent taps, polarity, impedance and certification of transformer performance efficiency at indicated loads, percentage regulation at 100% and 80% power factor, no-load and full-load losses in watts, % impedance at 75 degrees C hot-spot and average temperature rise above 40 degrees C ambient, sound level in decibels, and standard published data.

- B. Shop Drawings: Submit manufacturer's drawings indicating above data, dimensions, and weight loadings for transformer installations, showing layout, mountings and supports, spatial relationship to associated equipment, and transformer connections to electrical equipment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. ACME Electric
 - 2. Siemen
 - 3. General Electric Company
 - 4. Hevi-Duty Electric Div., General Signal Corp.
 - 5. Square D Company
 - 6. Sorgel Electric Div./Square D Co.
 - 7. Westinghouse Electric Corp.

2.2 POWER/DISTRIBUTION TRANSFORMERS

- A. General: Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for complete installation.
- B. Dry-Type Distribution Transformers (below 45 KVA): Provide factory-assembled, general-purpose, ventilated, dry-type distribution transformers where shown; of sizes, characteristics, and rated capacities indicated; 3-phase, 60-hertz, 5.75% impedance insulation per NEMA ST20; with 480-volt delta-connected primaries; and 208/120 volt, 4 wires wye-connected secondaries with grounded neutral. Provide primary windings with 6 taps; two 2-1/2% increments above full-rated voltage and four 2-1/2% increments below full-rated voltage for de-energized tap-changing operation. Insulate with Class 220°C insulation. Rate transformer for continuous operation at rated KVA; limit transformer surface temperature rise to maximum of 115 degrees C. Provide terminal enclosure, with cover, to accommodate primary and secondary coil wiring connections and electrical supply raceway terminal connector. Provide terminal board with clamp type connectors. Limit terminal compartment temperature to 75 degrees C when transformer is operating continuously at rated load with ambient temperature of 40 degrees C. Provide wiring connections suitable for copper or aluminum wiring. Integrally mount vibration isolation supports between core and coil assembly and transformer enclosure; electrically ground core and coils to transformer enclosure by means of flexible metal grounding strap. Do not exceed maximum sound-level rating of

45 db as determined in accordance with ANSI/NEMA standards. Provide transformers with fully-enclosed weather-resistant steel enclosures, and lifting lugs. Apply manufacturer's standard light grey outdoor enamel over cleaned and phosphatized steel enclosure. Provide transformers suitable for floor mounting. Install nonventilated NEMA 4XSS transformers as indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION OF TRANSFORMERS

- A. Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, ANSI and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.
- C. Install units on vibration mounts; comply with manufacturer's indicated installation method if any.
- D. Connect transformer units to electrical wiring system; comply with requirements of other Electrical Work sections.
- E. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- F. Examine walls and floors for suitable mounting conditions where transformers will be installed.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
 - 1. Brace wall-mounting transformers as specified in Division 26 "Seismic Controls for Electrical Work."
- B. Install floor-mounting transformers level on concrete bases. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit and 4 inches (100 mm) high.
 - 1. Anchor transformers to concrete bases according to manufacturer's written

instructions, seismic codes at Project, and requirements in Division 26 Section “Seismic Controls for Electrical Work.”

3.3 GROUNDING

- A. Provide equipment grounding connections, sufficiently tight to assure permanent and effective ground. Provide a separately derived grounding point for each transformer. Extend grounding conductor to an earth electrode and building steel. Where available, connect to a cold water main.

3.4 TESTING

- A. Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformers, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting. Test voltage and connect tap setting for an acceptable no load voltage level.

END OF SECTION 26 22 00

SECTION 26 24 16 PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of panelboard, load-center, and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules.
- B. Types of panelboards and enclosures in this section include the following:
 - 1. Power-distribution panelboards
 - 2. Lighting and appliance panelboards
- C. Refer to other Electrical work sections for cable/wire, connectors and electrical raceway work required in conjunction with panelboards and enclosures; not work of this section.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of panelboard and enclosure):
 - 1. General Electric Company
 - 2. Siemens
 - 3. Square D Company
 - 4. Cutler-Hammer

2.2 PANELBOARDS

- A. Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information; equip with number of unit panelboard devices as required for complete installation. Where more than one type of component meets indicated requirements, selection is Installer's option. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for applications indicated.
- B. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities,

ratings, door in door construction, types and arrangement shown; with anti-turn solderless pressure type lug connectors approved for copper conductors; construct unit for connecting feeders at top or bottom of panel as arrangement requires; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty molded case circuit breakers; provide suitable lugs on neutral bus for each outgoing feeder required; provide bare uninsulated grounding bar suitable for bolting to enclosure; and provide panelboards fabricated by same manufacturer as enclosures, and which mate properly with enclosure. Provide panels for 208Y/120-Volt or 480Y/277-Volt service as determined for the use. Provide NEMA 4XSS panelboards as indicated on drawings.

- C. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gauge thickness. Construct with multiple knockouts and wiring gutters. Provide fronts 3 point single lockable handle and be mounted inside the Arc Armour pump control panel enclosure. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor. Design enclosure for surface mounting as indicated. Provide enclosures fabricated by same manufacturer as panelboards, and which mate properly with panelboards to be enclosed. Provide panels for 208Y/120-Volt or 480Y/277-Volt service as determined by the use. Provide NEMA 4XSS panelboards as indicated on drawings. All NEMA 4XSS Enclosures shall be continuous hinge with lockable 3-point latching door. Inner door shall be hinged as well.
- D. Panelboard Accessories: Provide panelboard accessories and devices including, but not necessarily limited to, cartridge and plug time-delay type fuses, circuit breakers, ground-fault protection units, etc., as recommended by panelboard manufacturer for ratings and applications indicated. Provide extra gutter space; split-bus; contactor space; and circuit breaker arrangement to accommodate the energy management system described in other specifications. Provide suitable enclosure space to accommodate time clock; relays; contactors and control items as shown on the drawings. The separate space shall be under a separate door located at the top of the panel with locking provisions.

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELBOARDS

- A. Install panelboards and enclosures where indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.
- C. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are

permanently and mechanically secure.

- D. Provide electrical connections within enclosures.
- E. Fill out panelboard's circuit directory card upon completion of installation work. Directory shall be type written.
- F. Provide 6-each empty 3/4" conduits stubbed out above ceiling from all recessed panelboards.

END OF SECTION 26 24 16

SECTION 26 27 13.1 SERVICE ENTRANCE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of service-entrance work is indicated by drawings, schedules as directed by the Electric Power Utility Company, and as necessary to supply power to the building project.
- B. New services: Provide electrical service entrance work as directed by the utility company and required by the contract documents. Contact the utility company prior to starting construction and coordinate the electric service work. Provide all service related work as required and as directed by the utility company.
- C. Existing Service Addition: Provide additions, extensions and improvements to existing electrical services as indicated by the contract documents. Notify the utility company of the proposed new service work. Comply with request and directions of the serving utility company where required. Maintain services to existing facilities during new service addition construction work.
- D. Switchboards or Motor Control Center used for service-entrance equipment are specified in applicable Electrical work section, and are included as work of this section.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE EQUIPMENT

- A. General: Provide service-entrance equipment and accessories; of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified.
- B. Overcurrent Protective Devices: Provide overcurrent protective devices complying with Electrical Work Basic Materials and Methods section "Overcurrent Protective Devices", in accordance with the following listing:
 - 1. Molded case circuit breakers
 - 2. Class L. Fuses
 - 3. Ground fault interrupting system

- C. Cable/Wiring: Provide cable/wiring complying with Electrical Work Basic Materials and Methods section "Wires and Cables", in accordance with the utility company requirements.
- D. Raceways: Provide raceways complying with Electrical Work Basic Materials and Methods section "Raceways", in accordance with the utility company utility requirements, code requirements, and as indicated by the drawings and schedules.
- E. Where check metering is indicated on the drawings, provide KWH/KWD meter, current transformers, potential transformers and accessories necessary for metering the class and type of service being metered. Metering must be installed and certified by a skilled meter installer.
- F. Provide adjustable ground fault sensing and interrupting systems on the main service entrance devices.

PART 3 - EXECUTION

3.1 INSTALLATION OF SERVICE ENTRANCE EQUIPMENT

- A. Install service-entrance equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC and NEMA standards and the utility company requirements.
- B. Coordinate with other electrical work, including utility company wiring, as necessary to interface installation of service-entrance equipment work with other work. Pay all fees and charges relating to the service entrance work.
- C. Install fuses, if any, in service-entrance equipment.
- D. Install ground-fault protection devices complying with NEC requirements and where indicated otherwise.
- E. Set field-adjustable GFP devices and circuit breakers for pickup and time-current sensitivity ranges as for maximum selective coordination, subsequent to installation of devices and CB's.
- F. Provide transformer and equipment pads, metering facilities and related service work in compliance with the utility company requirements.
- G. Prior to the start of construction, submit copies of service related design drawings to the utility company serving the facility. This submittal shall include the proposed voltage, connected load and estimated demand. Notify the Engineer of any conflicts between the

design and the power utility requirements.

3.2 GROUNDING

- A. Provide tight system and equipment grounding and bonding connections for service-entrance equipment and wiring/cabling as indicated.
- B. Extend a code size copper grounding electrode in any underground service entrance trench and connect to the utility ground grid.
- C. Provide and install all grounding materials illustrated or as a minimum as required by the NEC.

3.3 ADJUST AND CLEAN

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred enclosure surfaces to match original finishes.

3.4 FIELD QUALITY CONTROL

- A. Upon completion of installation of service-entrance equipment and electrical circuitry, energized circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

3.5 METERING

- A. Provide service arrangement, metering equipment, cabinets, raceway, conductor, brackets and installation work as directed by the utility company.
- B. Arrange for the permanent revenue metering arrangements in coordination with the Owner.

END OF SECTION 26 27 13.1

SECTION 26 27 26 WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
 - 1. Receptacles
 - 2. Switches
 - 3. Wall plates
 - 4. Plugs
 - 5. Plug connectors

1.2 COORDINATION

- A. Receptacles shall match plug configurations for owner-furnished equipment.
- B. Provide cord and plug sets to match equipment requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Bryant Electric Co.
 - 2. Eagle Manufacturing
 - 3. Harvey Hubbell Inc.
 - 4. Pass and Seymour Inc.
 - 5. Leviton Manufacturing
 - 6. Wiremold Company

2.2 FABRICATED WIRING DEVICES

- A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and complying with NEMA Stds pub No. WD 1, NEMA WD6, UL498, and DSCC W-C5966. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements, and complying with NEC and NEMA standards for wiring devices. Wiring devices other than those listed shall be of the type and rating required for service.
- B. Wiring device color shall match existing.
- C. Receptacles:
 - 1. General-Duty Duplex: 2 pole, 3 wire, 20 amp 125 volt grounding receptacle. Molded urea or nylon face, side wired, screw terminals, self grounding. Bryant Cat. No. 5342-1, or equal by Hubbell, P & S, Leviton, or Eagle.
 - 2. General-Duty Simplex: 2 pole, 3 wire, 30 amp 250 volt grounding receptacle. Black color molded urea or nylon face, side wired, screw terminals, self grounding. Bryant Cat. No. 9630-FR, or equal by Hubbell, P & S, Leviton or Eagle.
 - 3. Special-Duty Combination: One boss 2 pole, 3 wire, 20 amp 125 volt, second boss 2 pole, 3 wire, 20 amp 250 volt, grounding receptacle. Molded urea or nylon face, side wired, screw terminals, self grounding. Bryant Cat. No. 5492-I, or equal by Hubbell, P & S, Leviton or Eagle.
 - 4. Special-Duty Isolated Ground: 2 pole, 3 wire, 20 amp 125 volt isolated ground receptacle. Orange color molded urea or nylon face, side wired, screw terminals. Bryant Cat. No. 5362IG, or equal by Hubbell, P & S, Leviton, or Eagle.
 - 5. Special-Duty GFI Duplex: 2 pole, 3 wire, 20 amp, 125 volt grounding, ground fault, feed through, receptacle. Molded urea or nylon face, with wiring leads. Bryant Cat. No. GFR 53T-I, or equal by Hubbell, P & S, Leviton, or Eagle.
 - 6. Special-Duty Range: 3 pole, 3 wire, 50 amp, 125/250 volt, straight blade, flush receptacle. Black molded melamine or phenolic face, back wired, screw terminals. Bryant Cat. No. 9306, or equal by Hubbell, P & S, Leviton, or Eagle.
- D. Switches
 - 1. Single Pole: General use snap switch rated 20 amp, 120/277 volt, (red face), side wired, screw terminals. Bryant Cat. No. 4901-I, or equal by Hubbell, P & S, Leviton, or Eagle.
 - 2. Double Pole: General use snap switch rated 20 amp, 120/277 volt, (red face), side wired, screw terminals. Bryant Cat. No. 4902-1, or equal by Hubbell, P &

S, Leviton or Eagle.

3. Three Way: General use snap switch rated 20 amp, 120/277 volt, (red face), side wired, screw terminals. Bryant Cat. No. 4903-I, or equal by Hubbell, P & S, Leviton or Eagle.
4. Four Way: General use snap switch rated 20 amp, 120/277 volt, (red face), side wired, screw terminals. Bryant Cat. No. 4904-I, or equal by Hubbell, P & S, Leviton, or Eagle.
5. Single Pole With 277 Volt Pilot Light: Special application snap switch rated 20 amp, 277 volt, (red face), clear handle with red pilot light, side wired, screw terminals. Bryant Cat. No. 4901 PLR277, or equal by Hubbell, Leviton, P & S., or Eagle.
6. Single Pole With 120 Volt Pilot Light: Special application snap switch rated 20 amp, 120 volt, (red face), clear handle with red pilot light, side wired, screw terminals. Bryant Cat. No. 4901PLR120, or equal by Hubbell, Leviton, P. & S., or Eagle.

E. Pendant cord/connector devices

1. Description: Matching, locking-type plug and receptacle body connector, NEMA WD6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
 - (a) Body: Nylon with screw-open cable-gripping jaws and provisions for attaching external cable grip.
 - (b) External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire stand, matched to cable diameter, and with attachment provision designed for corresponding connector.

F. Cord and plug sets

1. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.3 WIRING DEVICE ACCESSORIES

- A. Wall Plates: Provide single-switch and duplex outlet wall plates for wiring devices, of types, sizes, and with ganging and cutouts as indicated. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates; plate color shall match wiring devices. Provide wall plates possessing the following additional construction features:
 - 1. Receptacle Wall Plates: Molded high impact nylon, smooth finish. Bryant Series 88000, or equal by Hubbell, Leviton, P & S, or Eagle.
 - 2. Switch Wall Plates: Molded high impact nylon, smooth finish. Bryant Series 88000, or equal by Hubbell, Leviton, P & S, or Eagle.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.
- D. Install galvanized steel wall plates in unfinished spaces.
- E. Delay installation of wiring devices until wiring work is completed.
- F. Delay installation of wall plates until after painting work is completed.
- G. Adjust location of service poles to suit arrangement of partitions and furnishings.

3.2 PROTECTION OF WALL PLATES AND RECEPTACLES

- A. Upon installation of wall plates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Substantial completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

3.3 GROUNDING

- A. Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

3.4 TESTING

- A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring of devices to demonstrated compliance with requirements.

END OF SECTION 26 27 26

SECTION 26 28 12
MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of motor and circuit disconnect switch work is indicated by drawings, schedules, and code requirements. Types of motor and circuit disconnect switches in this section including the following:
 - 1. Equipment disconnects
 - 2. Appliance disconnects
 - 3. Motor-circuit disconnects

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. General Electric Co.
 - 2. Siemens
 - 3. Square D Company
 - 4. Cutler-Hammer

2.2 FABRICATED SWITCHES

- A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, sheet steel enclosed safety switches, of types, sizes and electrical characteristics indicated; fusible type, rated 240 volts or 4XSS, 600 volts, 400 amperes and below, 60 hertz, 3-blades, 4-poles, solid neutral; incorporating quick-make, quick-break type switches; so construct that switch blades are visible in OFF position with door open. Equip with operating handle which is integral part of enclosure base and whose position is easily recognizable, and is padlockable in OFF position; construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA type 4XSS enclosure for outdoor.
- B. Fuses: Provide fuses for safety switches, as recommended by switch manufacturer, of classes, types, and ratings needed to fulfill electrical requirements for service indicated.

Provide fuses to match equipment label requirements when fuse information is furnished as part of the equipment label.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES

- A. Install motor and circuit disconnect switches where required by code, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
- C. Install disconnect switches used with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.
- D. Mount disconnect switches securely. Use stainless steel or silicon bronze fasteners for mounting outdoor switches.
- E. Where building walls or equipment frames do not provide suitable mounting surface, provide galvanized unistrut frames or racks which will securely support the disconnect switch. Indoor frames may be painted unistrut frames.

END OF SECTION 26 28 12

SECTION 26 28 16
OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of overcurrent protective device work is indicated by drawings, schedules, and code requirements.
- B. Types of overcurrent protective devices in this section include the following:
 - 1. Circuit breakers
 - 2. Fuses
- C. Provide overcurrent protection for all electrical work.
- D. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one unit of each.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Circuit breakers:
 - a. General Electric Co.
 - b. Siemens
 - c. Square D Company
 - d. Cutler-Hammer
 - 2. Fuses:
 - a. Bussman Mfg. Co.
 - b. Littelfuse Co.

2.2 CIRCUIT BREAKERS

- A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated or required, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.
- B. Molded-Case Circuit Breakers: Provide factory-assembled, molded-case circuit breakers amperes rated as indicated on the drawings, 600-Volts for 480-Volt system and 240-Volts for 208-Volt system, 60 HZ, 3-pole or single-pole as indicated with RMS symmetrical interrupting ratings as required by the application and location within the distribution system. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Provide push-to-trip button on cover for mechanically tripping circuit breakers. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 C. Provide with mechanical screw type removable connector lugs, AL/CU rated.

2.3 FUSES

- A. General: Except as otherwise indicated, provide fuses of types, sizes and ratings and electrical characteristics indicated or required, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.
- B. Class L Fuses: Provide NEMA Class L fuses in current ratings indicated or required, for service entrances and main and feeder circuits.
- C. Class J (K-5) Fuses: Provide NEMA Class J (K-5), dual-element types, with time delay of 10 seconds at 500% of rating, for use with switches.
- D. Where equipment nameplate requires a specific fuse, the required fuse shall be furnished.

PART 3 - EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

- A. Install overcurrent protective devices as indicated or required, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation and application of overcurrent protective devices.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface

installation of overcurrent protective devices with other work.

- C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.
- D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of devices.
- E. Install fuses, if any, in fused circuit breakers and fused disconnect switches.

3.2 ADJUST AND CLEAN

- A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 28 16

SECTION 26 29 24 VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This section provides specification requirements for adjustable frequency drives, variable speed drives, or herein identified as VFD, for use with AC motors.
- B. The VFD manufacturer shall furnish, field test, adjust and certify all installed VFD's for satisfactory operation.

1.2 CODES/STANDARDS

- A. VFD and options shall be UL 508 listed.
- B. The drive and options shall comply with the applicable requirements of the latest standards of ANSI, NEMA, National Electric Code, NEC, NEPU-70, IEEE 519-1992, FCC Part 15 Subpart J, CE96.

1.3 QUALITY ASSURANCE

- A. Each drive shall be subjected to the following test and quality control procedures:
 - 1. Every VFD shall be functionally tested under motor load. During this load test the VFD shall be monitored for correct phase current, Phase voltages, and motor speed. Correct Current Limit operation shall be verified by simulating a motor overload.
 - 2. Verification of proper factory presets by scrolling through all parameters shall be performed to ensure proper microprocessor settings. The computer port should also verify that the proper factory settings are loaded correctly in the drive.
 - 3. All options shall be functionally tested including operation of a motor in the ByPass mode if supplied. Proper heater coil installation in motor overload, if supplied, shall be verified

1.4 SERVICE

- A. The VFD manufacturer shall maintain and staff world-wide service centers. The manufacturers shall have the ability to test both the drives and motors in these service centers.

1. Start-up shall be included for each VFD provided.
2. Service engineers shall be employed by the distributor and be certified by the manufacturer to provide start-up service including physical inspection of drive and connected wiring and final adjustments to meet specified performance requirements. Distributor shall employ a factory certified automation engineer on-staff and on-call.
3. Contractor shall sub-contract the services of the integration sub-contractor for interfacing, final connections and programming of the variable frequency drives.

1.5 SHOP DRAWING AND ENGINEERING DATA

- A. Complete shop drawing and engineering data shall be submitted in accordance with the requirements of Section 01 33 23, Shop Drawings, Product Data and Samples.

1.6 STORAGE AND PROTECTION

- A. Store and protect the screening equipment in accordance with the requirements of Section 01 66 00, Storage and Protection.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit complete operation and maintenance data in accordance with the requirements of Section 01 78 23, Operating and Maintenance Data. Six copies of the O&M Manuals should be provided.

1.8 GUARANTEE

- A. Provide a guarantee against defective and deficient equipment and workmanship in accordance with the requirements of Section 01 78 36, Warranties and Bonds.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following (for each type of variable frequency drive):
 1. Schneider Electric/Square D Co.
 2. Allen Bradley
 3. Engineer approved equal

2.2 GENERAL DESCRIPTION

- A. The VFD shall convert the input AC main power to an adjustable frequency and voltage as defined below:
 - 1. The AC Drive manufacturer shall use a 6-Pulse full wave bridge rectifier design with 5% line reactors. The diode rectifiers shall convert fixed voltage and frequency, AC line power to fixed DX voltage. The power section shall be insensitive to phase rotation of the AC line.
- B. The output power section shall change fixed DC voltage to adjustable frequency AC voltage. This section shall use insulated gate bipolar transistors (IGBT) or intelligent power modules (IPM) as required by the current rating of the motor.

2.3 CONSTRUCTION

- A. The VFD shall be mounted inside the pump control enclosure in a NEMA 1 enclosure.
- B. A mechanical interlock shall prevent an operator from opening the VFD door when the disconnect is in the “ON” position. Another mechanical interlock shall prevent an operator from placing the disconnect in the “ON” position while the VFD door is open. It shall be possible for authorized personnel to defeat these interlocks.
- C. Provisions shall be provided for locking all disconnects in the “OFF” position.
- D. The VFD shall include mechanically and electrically interlocked integrated isolation complete with a Class 20 thermal overload relay, circuit breaker disconnect, control circuit transformer and HAND/OFF/AUTO selector switch.

2.4 MOTOR DATA

- A. The VFD shall be sized to operate AC motors per the pump supplier/manufacturer recommendations and to be non-overloading at pump FLA beyond the VFD nameplate, published rating.

2.5 APPLICATION DATA

- A. The VFD shall be sized to operate a Variable Torque as required by the use.
- B. The speed range shall be from a minimum speed of 0.5 Hz to a maximum speed of 400 Hz.

2.6 ENVIRONMENTAL RATINGS

- A. The VFD shall be of construction that allows operation in a pollution Degree 3 environment. The VFD shall meet IEC 664-1 and NEMA ICS 1 Standards. VFD’s that are only rated for Pollution Degree 2 environment shall not be allowed.

- B. The VFD shall be designed to operate in an ambient temperature from -10 to + 40 °C (+14 to 104 °F).
- C. The storage temperature range shall be -25 to + 70 °C.
- D. The maximum relative humidity shall be 95% at 40 °C, non-condensing.
- E. The AC drive shall be rated to operate at altitudes less than or equal to 3,300 ft (1000 m). For altitudes above 3,300 ft, de-rate the AC Drive by 1.2% for every 300 ft (100 m).
- F. The AC drive shall meet the IEC 600721-3-3-3M3 Operational Vibration Specification.

2.7 RATINGS

- A. The AC Drive shall be designed to operate from an input voltage of and $460 \pm 10\%$ Vac.
- B. The AC Drive shall operate from an input voltage frequency range of $60 \text{ Hz} \pm 2\%$.
- C. The displacement power factor shall not be less than .95 lagging under any speed or load condition.
- D. The efficiency of the AC Drive at 100% speed and load shall not be less than 96%.
- E. The variable torque rated VFD over-current capacity shall be 110% for one minute.
- F. The output carrier frequency of the VFD shall be randomly modulated and selectable at 2, 4, or 10 kHz depending on Drive rating for low noise operation. No VFD with an operable carrier frequency above 10 kHz shall be allowed.
- G. The output frequency shall be from 0.1 to 500 Hz for VFD's.
- H. The VFD shall be able to develop rated motor torque at 0.5 Hz (60 Hz base) in a sensorless flux vector (SVC) mode using a standard induction motor without an encoder feedback signal.

2.8 PROTECTION

- A. Upon power-up the VFD shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, dynamic brake failure, DC to DC power supply, control power and the pre-charge circuit.
- B. The VFD shall be UL 508C listed for use on distribution systems with 100,000 A RMS available fault current. The VFD have a coordinated short circuit rating designed to UL 508C and NEMA ICS 7.1.09 and listed on the nameplate.

- C. The Power Converter shall be protected against short circuits, between output phases and ground; and the logic and analog outputs.
- D. The VFD shall have a minimum AC undervoltage power loss ride-through of 200 msec. The VFD shall have the user-defined option of frequency fold-back to allow motor torque production to continue to increase the duration of the power loss ride-through.
- E. The VFD shall have a selectable ride through function that will allow the logic to maintain control for a minimum of one second without faulting.
- F. For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function will provide up to 5 programmable restart attempts. The programmable time delay before restart attempts will range from 1 second to 600 seconds.
- G. The deceleration mode of the VFD shall be programmable for normal and fault conditions. The stop modes shall include free-wheel stop, fast stop and DC injection braking.
- H. Upon loss of the analog process follower reference signal, the VFD shall fault and/or operate at a user-defined speed set between software programmed low-speed and high-speed settings.
- I. The VFD shall have solid state I^2t protection that is UL Listed and meets UL 508C as a Class 10 overload protection and meets IEC 60947. The minimum adjustment range shall be from .20 to 1.50% of the nominal current output of the VFD
- J. The VFD shall have a thermal switch with a user selectable pre-alarm that will provide a minimum of 60 seconds delay before over-temperature fault.
- K. The VFD shall use bonded fin heat-sink construction for maximum heat transfer.
- L. The VFD shall have a programmable fold-back function that will anticipate a controller overload condition and fold back the frequency to avoid a fault condition.
- M. The output frequency shall be software enabled to fold back when the motor is overloaded.
- N. There shall be three skip frequency ranges that can each be programmed with a selectable bandwidth of 2 or 5 Hz. The skip frequencies shall be programmed independently, back to back or overlapping.

2.9 ADJUSTMENTS AND CONFIGURATIONS

- A. The VFD shall self-configure to the main operating supply voltage and frequency. No operator adjustments will be required.

- B. Upon power-up, the VFD will automatically send a signal to the connected motor and store the resulting resistance data into memory. The inductance data will be measured during no-load operation when operating at a frequency between 20-60 Hz. The VFD will automatically optimize the operating characteristics according to the stored data.
- C. The VFD will be factory pre-set to operate most common applications.
- D. A choice of three types of acceleration and deceleration ramps will be available in the VFD software; linear, S curve and U curve.
- E. The acceleration and deceleration ramp times shall be adjustable from 0.01 to 9000 seconds.
- F. The volts per frequency ratios shall be user selectable to meet variable torque loads, normal and high-torque machine applications.
- G. The memory shall retain and record run status and fault type of the past eight faults.
- H. Slip compensation shall be software-enabled function.
- I. The software shall have an “energy saving” function that will reduce the voltage to the motor when selected for variable torque loads. A constant volts/Hz ratio will be maintained during acceleration. The output voltage will then automatically adjust to meet the torque requirement of the load.
- J. The VFD shall offer programmable DC injection braking that will brake the AC motor by injecting DC current and creating a stationary magnetic pole in the stator. The level of current will be adjustable between 10-110% of rated current and available from 0.1-30 seconds continuously. For continuous operation after 30 seconds, the current shall be automatically reduced to 50% of the nameplate current of the motor.
- K. Sequencing logic will coordinate the engage and release thresholds and time delays for the sequencing of the VFD output, mechanical actuation and DC injection braking in order to accomplish smooth starting and stopping of a mechanical process.

2.10 OPERATOR INTERFACE

- A. The operator interface terminal will offer the modification of VFD adjustments via a touch keypad. All electrical values, configuration parameters, I/O assignments, application and activity function access, faults, local control, adjustment storage, self-test and diagnostics will be in plain English. There will be a standard selection of four additional language built-in to the operating software as standard.
- B. The display will be a high-resolution, LCD backlit screen capable of displaying graphics such as bar graphs as well as 8 lines of 240 x 160 pixels.

- C. The VFD model number, torque type, software revision number, horsepower, output current, motor frequency and motor voltage shall all be listed on the drive identification display as viewed on the LCD display.
- D. The display shall be configured for up to two bar graphs with numeric data selectable and scalable by the operator. A user defined label function shall be available. As a minimum the selectable outputs shall consist of speed reference, output frequency, output current, motor torque, output power, output voltage, line voltage, DC voltage, motor thermal state, drive thermal state, elapsed time, motor speed, machine speed reference and machine speed.
- E. A single keystroke scrolling function shall allow dynamic switching between display and variables.
- F. The terminal keypad will consist of programmable function keys. The functions will allow both operating commands and programming options to be preset by the operator. A hardware selector switch will allow the terminal keypad to be locked out from unauthorized personnel.
- G. The operator terminal will offer a general menu consisting of parameter setting, I/O map, fault history, and drive configuration. A software lock will limit access to the main menu. The main menu will consist of keypad configuration, drive configuration, general configuration, diagnostic mode and drive initialization screens.
- H. There will be arrow keys that will provide the ability to scroll through menus and screens, select or activate functions or increase the value of a selected parameter
- I. A data entry key will allow the user to confirm a selected menu, numeric value or allow selection between multiple choices.
- J. An escape key will allow a parameter to return the existing value if adjustment is not required and the value is displayed. The escape function will also return to a previous menu display.
- K. A RUN key and a STOP key will command a normal starting and stopping as programmed when the VFD is in keypad control mode. The STOP key must be active in all control modes.
- L. The VFD shall have three LEDs mounted on the front panel to indicate functional status. A green LED will verify that the VFD power supply is on. A red LED indicator will indicate a VFD fault. A yellow LED indicator will designate a pending fault condition.
- M. A user interface shall be available that is a WINDOWS[®] based personal computer, serial communication link or detachable operator interface.

- N. The keypad and all door mounted controls must match the rating of the enclosure.
- O. Provide additional door mounted controls as indicated in control diagrams on the plans.

2.11 CONTROL

- A. External pilot devices shall be able to be connected to a terminal strip for starting/stopping the VFD, speed control and displaying operating status. All control inputs and outputs will be software assignable.
- B. 2-wire or 3-wire control strategy shall be defined within the software. 2-wire control allows automatic restart of the VFD without operator intervention after a fault or loss of power. 3-wire control requires operator intervention to restart the VFD after a fault or loss of power.
- C. The control power for the digital inputs and outputs shall be 24 Vdc.
- D. The internal power supply incorporates an automatic current fold-back that protects the internal power supply if incorrectly connected or shorted. The transistor logic outputs will be current limited and not be damaged if shorted or excess current is pulled.
- E. All logic connections shall be furnished on pull apart terminal strips.
- F. There shall be (2) two software assignable, optically isolated analog inputs. The analog inputs will be software selectable and consist of the following configurations: 0-20 mA, 4-20 mA, 20-4 mA, x-20 mA (where x is user defined) 0 to 5 V, 1 to 5 V or 0 to 10 V.
- G. There shall be four software assignable, optically isolated logic inputs that will be selected and assigned in the software. The selection of assignments shall consist of run/reverse, jog, plus/minus speed (2 inputs required), set point memory, preset speeds (up to 2 inputs), auto/manual control, controlled stop, terminal or keypad control, by-pass (2 inputs required), motor switching, and fault reset.
- H. There shall be two software assignable optically isolated analog outputs that can be selected and assigned in the software. The analog output assignments shall be proportional to the following motor characteristics: frequency, current, power torque, voltage and thermal state. The output signal will be selectable from 0 to 20 mA or 4 to 20 mA.
- I. Two voltage-free Form C relay output contacts will be provided. One of the contacts will indicate VFD fault status. The other contact will be user assignable.
- J. There shall be a hardware input/output extension module that also provides interlocking and sequencing capabilities. The module shall be fully isolated and housed in a finger-safe enclosure with pull apart terminal strips. The module will add four logic inputs, two

analog inputs, two relay outputs, and one analog output. All of the I/O will be user assignable in the software as previously defined.

- K. The VFD door-mounted Control Island shall include a Power ON, Drive RUN, Drive Fault Light and Hand-Off-Auto selector switch with Manual Speed Potentiometer.
- L. Provide and install pump moisture and thermal relays to shutdown on high thermal and moisture indication.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that the location is ready to receive work and the dimensions are as indicated.
- B. Do not install VFD equipment until the building environment can be maintained within the service conditions required by the manufacturer.

3.2 PROTECTION

- A. Before and during the installation, the VFD equipment shall be protected from site contaminants.

3.3 INSTALLATION

- A. Installation shall comply with manufacturer's instructions, drawings and recommendations.

3.4 TRAINING

- A. An on-site training course of 1 training day shall be provided by a representative of the VFD manufacturer plant and/or maintenance personnel.

END OF SECTION 26 29 24

DIVISION 31: EARTHWORK

1.1 SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

- A. Clear site within construction limits of trees and shrubs and other vegetation.
- B. Remove surface debris.

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 EXISTING TREES AND OTHER VEGETATION

- A. The Contractor shall not cut or injure any trees or other vegetation outside right-of-way or easement lines and outside areas to be cleared, as indicated on the Drawings, without written permission from HCWD1. The Contractor shall be responsible for all damage done outside these lines.
- B. Trees shall be removed within permanent and temporary easement lines or right-of-way lines for the construction of water, sanitary sewer and storm lines and appurtenances.

3.02 CLEARING

- A. From areas to be cleared, the Contractor shall cut or otherwise remove all trees, brush, and other vegetable matter such as snags, bark and refuse. The ground shall be cleared to the width of the permanent easement or right-of-way unless otherwise directed by the Engineer.
- B. Except where clearing is done by uprooting with machinery, trees, stumps, and stubs to be cleared shall be cut as close to the ground surface as practicable, but no more than 6 inches above the ground surface for small trees and 12 inches for larger trees.

- C. Elm bark shall be either buried at least 1 foot deep or burned in suitable incinerators off site with satisfactory antipollution controls and fire prevention controls, to prevent the spread of Dutch Elm disease and as required by applicable laws.

3.03 GRUBBING

From areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of 12 inches all roots larger than 3-inch diameter, and remove to a depth of 6 inches all roots larger than 1/2-inch diameter. Such depths shall be measured from the existing ground surface or the proposed finished grade, whichever is lower.

3.04 STRIPPING OF TOPSOIL

Prior to starting general excavation, strip topsoil to a depth of 6 inches or to depths required by the Engineer. Do not strip topsoil in a muddy condition and avoid mixture of subsoil. Stockpile the stripped topsoil within easement or right-of-way lines for use in finish grading and site restoration. Topsoil stockpiled shall be free from trash, brush, stones over 2 inches in diameter and other extraneous material.

3.05 PROTECTION

- A. Protect trees, shrubs and other plant growth if required by special provision of the easement as final landscaping.
- B. Protect bench marks and existing work from damage or displacement.
- C. Maintain designated site access for vehicle and pedestrian traffic.

3.06 REMOVAL

- A. All material resulting from clearing and grubbing and not scheduled for reuse 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 soon as possible after removal of the material and shall not be left until the final period of cleaning up.

END OF SECTION 31 10 00

SECTION 31 23 33
EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

The Contractor shall make excavations in such widths and depths as will give suitable room for below grade vaults, pump stations, etc., laying pipe to the lines, grades and elevations, furnish, place and compact all backfill materials specified herein or denoted on the Drawings. The materials, equipment, labor, etc., required herein are to be considered as part of the requirements and costs for installing the various pipes, structures and other items they are incidental to.

1.03 RELATED WORK

- A. Division 33 “Water Pipe and Fittings”.
- B. Drawing details.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Crushed stone material shall conform with the requirements of the applicable sections of the Kentucky Bureau of Highways Standard Specifications and shall consist of clean, hard, and durable particles or fragments, free from dirt, vegetation or objectionable materials.
- B. Two types of crushed stone material are used in this Section, No. 9 Aggregate and Dense Graded Aggregate (DGA).

PART 3 - EXECUTION

3.01 EXCAVATION OF TRENCHES

- A. Unless otherwise directed by the Engineer, trenches are to be excavated in open cuts.
 - 1. Where pipe is to be laid in gravel bedding or concrete cradle, the trench may be

- excavated by machinery to, or just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed and is suitable to support the installed pipe.
2. Pipe shall never be laid directly on trench bottom.
- B. Trenches shall be sufficient width (minimum 30 inches) to provide working space on each side of the pipe and to permit proper backfilling around the pipe.
1. The Contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the Work. The pavement shall be cut without extra compensation to the Contractor, to prevent damage to the remaining road surface. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
- C. All excavated materials shall be placed a safe distance back from the edge of the trench.
- D. Unless specifically directed otherwise by the Engineer, not more than 500 feet of trench shall be opened ahead of the pipe laying work of any one crew, and not more than 500 feet of open ditch shall be left behind the pipe laying work of any one crew. Watchmen or barricades, lanterns and other such signs and signals as may be necessary to warn the public of the dangers in connection with open trenches, excavations and other obstructions, shall be provided by and at the expense of the Contractor. Temporary fencing will be required around any excavation in a residential area left unmonitored.
- E. When so required, or when directed by the Engineer, only one-half of street crossings and road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the Engineer.
- F. Trench excavation shall include the removal of earth, rock, or other materials encountered in the excavating to the depth and extent shown or indicated on the Drawings.

3.02 WATER AND FORCE MAIN BEDDING

- A. Piping for water and force mains shall be supported as follows:
1. The trench bottom for water and force main piping shall be excavated 6 inch below the pipe invert and bedded with a relatively smooth and free of frozen material, clodded dirt, foreign material and rock or granular material larger than 1/2 inch in diameter. When the trench is made through rock, the bottom shall be lowered to provide 6 inches of clearance around the pipe. No. 9 crushed stone bedding shall be used to bring the trench bottom to grade.
- B. After each pipe has been brought to grade, aligned, and placed in final position, earth material for water and force main piping in areas not subject to vehicular traffic and material for water and force mains in paved areas, shall be deposited and densified under the pipe haunches and on each side of the pipe up to the spring line of the pipe to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations. Densified bedding material shall be mechanically tamped in 8-

inch layers to obtain the maximum possible compaction as specified in Articles 3.08 and 3.09 herein.

- C. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of 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.
- D. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate. It is the Contractor's responsibility to contact the Engineer when this is encountered.
- E. The depth of the foundation is dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required No. 9 crushed stone bedding material can be placed.
- F. It should be noted that no pipe shall be laid on solid or blasted rock.
- G. Pipe bedding as required in Paragraphs A, B, C, and D of this Section is not considered a separate pay item.

3.03 WATER AND FORCE MAIN BACKFILLING

A. Initial Backfill:

- 1. This backfill is defined as that material which is placed over the pipe from the spring line to a point 6 inches above the top of the pipe. For water main piping in areas not subject to vehicular traffic, initial backfill material shall be earth material free of rocks, acceptable to the Engineer or with No. 9 crushed stone when a condition exists mentioned in Paragraph A, 3. below. For water main piping in paved areas, initial and final backfill shall be No. 9 crushed stone material, full depth. Granular backfill material shall be mechanically tamped in approximately 8-inch layers to obtain maximum possible compaction as specified in Articles 3.08 and 3.09 herein.
- 2. Material used, whether earth or crushed stone material, in the initial backfilling is not a separate pay item. Payment for the material is included in the unit price per linear foot of water main.
- 3. In areas where large quantities of rock are excavated and the available excavated earth in the immediate vicinity is insufficient for placing the required amount of backfill over the top of the pipe as set forth in Paragraph A.1, the Contractor shall either haul in earth or order No. 9 crushed stone material for backfilling over the pipe. Neither the hauling nor placement of earth nor the ordering and placement of crushed stone material to fulfill the backfill requirements set forth herein is considered a separate pay item.

B. Final Backfill:

- 1. There are two cases where the method of final backfilling varies. The various cases and their trench situations are as follows:
 - a. Case I - Areas not subject to vehicular traffic.

- b. Case II - Paved areas including streets, drives, parking areas, and sidewalks.
 - 2. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point 6 inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:
 - a. Case I - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 12 inches below the surface of the ground with earth material free from large rock (greater than 6 inches in the longest dimension), acceptable to the Engineer. The final backfill shall be mechanically tamped in approximately 8- inch layers to obtain maximum possible compaction as specified in Articles 3.08 and 3.09 herein. The remainder of the trench shall be backfilled with topsoil material free of any rocks.
 - b. Case II - The trench shall be backfilled from a point 6 inches above the top of the pipe to pavement replacement subgrade with No. 57 crushed stone aggregate material or flowable fill as noted on the Drawings. The backfill shall be mechanically tamped in approximately 8-inch layers to obtain the maximum possible compaction as specified in Articles 3.08 and 3.09 herein. The remaining backfill shall be as follows:
 - (1) For gravel surfaces – DGA material mechanically tamped to maximum possible compaction. The trench may be left with a slight mound if permitted by the Engineer.
 - (2) For bituminous and concrete surfaces - Bituminous and Concrete pavement sections as detailed on the Drawings and as specified for Bituminous Pavement Replacement and Concrete Pavement Replacement.
 - 3. Earth and crushed stone material used in final backfill is not a separate pay item. Payment shall be included in the price of water and force main.
 - 4. DGA material used in final backfill for gravel surfaces shall be included in the unit price of the pipe. DGA material used as base for pavements shall be included in the unit price for pavement replacement.
- C. A sufficient amount of DGA material shall be stockpiled to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled or washed areas by the Contractor.
 - D. Excavated materials from trenches, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal, unless specific waste areas have been designated on the Drawings or noted in these Specifications. The cost of disposal of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.
 - E. Spoil materials that are hauled off projects Fort Knox MUST be disposed of at the Fort Knox landfill.

3.04 BEDDING AND BACKFILLING PROCEDURES

- A. Place all bedding in pipe trenches in horizontal layers not exceeding 8 inches in depth up to a point 6 inches or more above the top of the pipe and thoroughly compact each layer along

- the full trench width before the next layer is placed.
- B. Backfill shall be placed in horizontal loose lifts not exceeding 8 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness after placing. Backfill shall then be compacted as specified in Article 3.09, Compaction, up to 8 inches from existing ground level in non-paved areas or pavement subgrade level in paved areas.
 - C. Perform compaction of bedding and backfill with equipment suitable for the type of material placed and which is capable of providing the densities required. Contractor shall select compaction equipment and submit it and his proposed procedure to Engineer for approval.
 - D. Bedding and backfill shall be compacted by at least two coverages of all portions of the surface of each lift by compaction equipment. One coverage is defined as the condition obtained when all portions of the surface of the material have been subjected to the direct contact of the compactor.
 - E. Test the effectiveness of the equipment selected by Contractor at the commencement of compaction by construction of a small section of trench bedding or backfill within the area where material is to be placed. If tests on this section show that the specified compaction is not obtained, Contractor shall increase the number of coverages, decrease the lift thickness or obtain a different type of compactor. No additional cost to Owner shall be incurred.

3.05 COMPACTION

- A. Granular Material:
 - 1. 85% relative density (ASTM D-4253 and D-4254).
- B. Earth Material:
 - 1. 90% standard proctor maximum dry density (ASTM D-698).

3.06 PLACEMENT OF IDENTIFICATION TAPE

- A. Detectable underground marking tape shall be placed over all utility lines. Care shall be taken to insure that the buried marking tape is not broken when installed and shall be Lineguard brand encased aluminum foil, Type III, or approved equal.
- B. The identification tape shall bear the printed identification of the utility line below it, such as "Caution - Buried Below". Tape shall be reverse printed; surface printing will not be acceptable. The tape shall be visible in all types and colors of soil and provide maximum color contrast to the soil. The tape shall meet the APWA color code, and shall be 2 inches in width. Colors are: yellow - gas, green - sewer, red - electric, blue - water, orange - telephone, brown - force main.
- C. The identification tape shall be the last equipment installed in the trench so as to be first out. The tape shall be buried 4 to 6 inches below top of grade. After trench backfilling, the tape shall be placed in the backfill and allowed to settle into place with the backfill. The tape may be plowed in after final settlement, installed with a tool during the trench backfilling process, unrolled before final restoration or installed in any other way acceptable to Owner or Engineer.

3.07 PLACEMENT OF LOCATION WIRE

- A. Detectable underground location wire shall be placed above all non-metallic water mains and force mains. Care shall be taken to insure that the buried wire is not broken. The location wire shall be taped to the pipeline every 5 feet.
- B. The location wire shall be #12 AWG solid copper-coated steel wire.
- C. The location wire shall be continuous from valve box to valve box and shall be terminated (unconnected) with a wire nut and enough loose wire to extend 24 inches outside the valve box.

END OF SECTION 31 23 33

SECTION 31 50 00 SHORING AND BRACING

PART 1 - GENERAL

1.01 SUMMARY

- A. Shoring and bracing of excavations shall be performed by the Contractor in compliance with Occupational Safety and Health Administration (OSHA) requirements and other applicable codes.
- B. Shore and brace sidewalls in excavations with steel sheet piles with wale systems or soldier piles with timber lagging and tie back system as required to protect existing buildings, utilities, roadways, and improvements.
- C. Maintain shoring and bracing during construction activities, and remove shoring and bracing if practical when construction and filling is complete.

1.02 SUBMITTALS

Provide copies of information on methods of the shoring and bracing system proposed for the work, design basis, calculations where applicable, and copies of shop drawings for inclusion in the project and job-site record files.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Shoring and bracing system design shall be prepared and sealed by a registered professional engineer or structural engineer. The system design shall provide the sequence and method of installation and removal. Shoring and bracing system design shall be in accordance with OSHA requirements 29 CFR Section 1926.652.

1.04 RELATED DOCUMENTS

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

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Sheet Piles: Heavy-gauge steel sheet.
- B. Soldier Piles: Steel H-beams.

- C. Timber Lagging: Heavy timber. Pressure treated with wood preservative for use below water table for extended time period.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in proper relation with adjacent construction. Coordinate with work of other sections.
- B. Locate shoring and bracing to avoid permanent construction. Anchor and brace to prevent collapse.

END OF SECTION 31 50 00

DIVISION 32: EXTERIOR IMPROVEMENTS

**SECTION 32 11 25
CRUSHED STONE PAVEMENT**

PART 1 - GENERAL

1.01 WORK INCLUDED

Crushed stone pavement, compacted.

1.02 REFERENCES

ASTM C33 - Aggregate for Concrete.

1.03 TESTS

Gradation of stone materials shall be performed in accordance with ASTM C33.

1.04 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental Conditions or General Provisions and Division 01 Specification sections, apply to work of this section.

PART 2 - PRODUCTS

2.01 MATERIALS

Crushed stone shall conform to ASTM C33, Type No. 57, Type No. 2, and No. 610.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Subgrade soils shall be compacted to at least 95 percent of standard Proctor maximum dry density. Verify compacted subgrade.
- B. Minimum slope of subgrade and pavement surface shall be one-quarter inch per foot to promote surface drainage. Verify that gradients and elevations of base are correct.

3.02 PAVEMENT THICKNESS

- A. Pavement thickness shall be provided as called for on the Drawings from the Engineer.
- B. The minimum pavement thickness provided shall be: 6 inches No. 3 stone and

- 6 inches DGA.
- C. Place stone in 6-inch layers and compact and level surfaces to elevations and gradients indicated.
 - D. Add small quantities of sand to stone mix as appropriate to assist compaction.
 - E. Add water to assist compaction. With an excess water condition, rework topping and aerate to reduce moisture content.

END OF SECTION 32 11 25

SECTION 32 12 16
BITUMINOUS PAVEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide bituminous pavement for following applications, with prepared subbase and compacted base.
 - 1. Roads.
 - 2. Parking areas.
 - 3. Driveways.
 - 4. Walkways.
 - 5. Curbs.
- B. Provide striping for parking, roadway, and handicapped markings.

1.02 SUBMITTALS

Submit for approval product data, test reports.

1.03 REGULATORY AGENCIES

Comply with encroachment or road cut permits, governing codes and regulations of the agency having jurisdiction over the roadways impacted by the Project. Agencies may include:

- A. Hardin County Roads Department
- B. City of Radcliff Public Works Department
- C. Kentucky Transportation Cabinet - Department of Highways, Elizabethtown District
- D. Fort Knox Directorate of Public Works

1.04 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental Conditions or General Provisions and Division 01 Specification sections, apply to work of this section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Prime coat: Cut-back asphalt.

- B. Tack coat: Emulsified asphalt.
- C. Asphaltic cement: AASHTO M226 and as required by local authorities.
- D. Aggregate: Crushed stone or crushed gravel.
- E. Traffic paint: Quick-drying chlorinated-rubber alkyd type, color as approved.
- F. Wheel-stops: Precast concrete of uniform color and texture with steel stakes.

PART 3 - EXECUTION

3.01 GENERAL

- A. Asphalt/aggregate Mixture: Comply with local agency Standard Specifications. Class as required by loading and use.
- B. Remove loose material from compacted subbase or existing pavement. Proof roll and check for areas requiring additional compaction. Beginning of work means acceptance of compacted subbase or condition of existing pavement and subbase.
- C. Apply prime coat to prepared surface. Apply tack coat to previous laid work and adjacent in-place concrete surfaces.
- D. Place bituminous concrete at minimum temperature of 225 degrees F in strips not less than 10' wide overlapping joints in previous courses. Complete entire base course thickness before beginning surface course.
- E. Construct curbs, where required, to dimensions indicated or if not indicated to standard shapes. Provide tack coat between curb and pavement.
- F. Begin rolling when pavement can withstand weight of roller. Roll while still hot to obtain maximum density and to eliminate roller marks.
- G. Provide 4" lane and striping paint in uniform, straight lines. Provide wheel stops where indicated and securely dowel into pavement. Protect work from traffic and damage.
- H. Test in-place asphalt work for thickness and smoothness. Remove and replace defective work and patch to eliminate evidence of patching. Provide the following minimum thickness and smoothness unless otherwise greater thickness is required on the Drawings:
 1. Trench Width Replacement – match existing subbase, base and surface course.

3.02 TRENCH WIDTH PAVEMENT REPLACEMENT

- A. Sections of pavement shall be replaced as required to install the pipelines. Disturbed pavement shall be reconstructed to original lines and grades with bituminous binder as detailed on the Drawings and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to these operations.

- B. Prior to trenching, the pavement shall be scored or cut to straight edges along each side of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be recut and trimmed as necessary to square, straight edges after the pipe has been installed and prior to placement of the binder course or concrete.
- C. Backfilling of trenches shall be in accordance with the applicable portions of Division 31 “Excavating, Backfilling, and Compacting for Utilities”.
- D. Bituminous base or bituminous surface shall be one course construction of an appropriate base or surface JMF prepared and installed in accordance with the requirements of the Kentucky Department of Highways.
 - 1. Placement and compaction of binder course shall be in accordance with Section 403 of the Kentucky Department of Highways Standard Specifications. Minimum thickness after compaction shall be as detailed on the Drawings.
- E. Concrete base, as detailed on the Drawings, shall be 4,000 psi conforming to the applicable requirements of Division 3.
- F. Bituminous pavement replacement is a separate pay item.

END OF SECTION 32 12 16

**SECTION 32 13 13
PAVEMENTS, WALKS, AND CURBS**

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This Section includes all labor, materials, equipment and related items required to complete the work of pavements, walks, and curbs shown on the Drawings and specified herein.
- B. This Section does not include the following related items:
 - 1. Clearing and grubbing.
 - 2. Earthwork, including establishing of subgrades for pavements, walks, and curbs.
 - 3. Storm drainage and utilities.
 - 4. Concrete work in connection with storm drainage.

1.02 COORDINATION

Coordinate carefully the Work specified in this Section with storm drainage and utility installations specified under other Sections of these Specifications. Notify the Engineer promptly of any conflict between work of this Section and that of other trades.

1.03 STATE SPECIFICATIONS

Where the words "State Specifications" are used herein, they shall be understood to refer to the Standard Specifications of the Kentucky Department of Highways. Reference to State Specifications is solely for the purpose of specifying kind and quality of materials and methods of construction. Where, in such specifications, the word "Engineer" or the title of any other State Official or employee appears, it shall for the purpose just stated and be understood to mean the duly authorized representative of HCWD1.

1.04 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental Conditions or General Provisions and Division 01 Specification sections, apply to work of this section.

PART 2 – PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 SUBGRADES FOR PAVEMENTS, WALKS, AND CURBS

- A. Grading. Do any necessary grading in addition to that performed in accordance with Division 31 “Excavating, Backfilling, and Compacting for Utilities” to bring subgrades after final compaction to the required grades and sections for pavements and curbs.
- B. Preparation of Subgrades. Loosen exceptionally hard spots and re-compact. Remove spongy and otherwise unsuitable material and replace it with stable material. Fill and tamp traces of storm drain trenches.
- C. Compaction of Subgrade. Compact the subgrades of all surface areas with appropriate compacting equipment or by other means to such degree as will ensure against settlement of the superimposed work.
- D. Checking Subgrade. Maintain all subgrade in satisfactory condition, protected against traffic and properly drained until the surface improvements are placed. Immediately in advance of concreting, check subgrade levels with templates riding the forms, correct irregularities and compact thoroughly any added fill material. On areas to receive concrete pavement, place grade stakes spaced sufficiently to afford facility for checking subgrade levels. Correct irregularities, compacting thoroughly any fill material.
- E. Drainage Structures. Check for correct elevation and position all manhole covers, grates, and similar structures located within areas to be paved and make, or have made, any necessary adjustments in such structures.

3.02 CONCRETE WORK

- A. General. Concrete and concrete materials for work of this Section shall conform to applicable requirements of Division 03, and, in addition the following:
 - 1. Concrete used in all work of this Section shall be Class A and shall have a minimum 28-day allowable compressive strength of 4,000 pounds per square inch, shall contain not less than six (6) sacks of cement per cubic yard, and shall be an air entrained type, with 4 percent to 6 percent total air content, by use of an approved air entraining agent as specified under Division 03.
- B. Requirements for forms, reinforcement, mixing, placing, finishing and curing shall be generally as specified for other concrete work under Division 03, as modified hereinafter under particular item specification.

3.03 CONCRETE CURBS

- A. General. Concrete curb and gutter and header curb shall be constructed in accordance with State Specifications at locations shown and to details shown on the Drawings. Curved forms shall be used where curbs are curved to a radius of 100 feet or less.
 - 1. The Contractor may, at his option, install extruded section curb and gutter and header curb. If used, the section, equipment, jointing provisions, etc., shall be reviewed by the Engineer and approved prior to installation.
- B. Contraction Joints. Construct concrete curbs in sections 6 to 10 feet long by use of 1/8-inch steel division plates. Such plates shall be of size and shape conforming to cross sections of the concrete and shall not be bent or otherwise deformed.

- C. Expansion Joints. Provide expansion joints with premolded filler cut to shape of cross section as follows: (1) at ends of all the returns, (2) at not more than 50 feet intervals. Expansion joints shall be at least 2-inch wide, and if adjoining pavement is concrete, of the same width and at same locations as expansion joints in the pavement.
- D. Finish. Tamp and screed concrete as soon as placed. Remove division plates and face forms as soon as practicable; fill any honeycombed places with 1:2 mortar and give exposed surfaces a smooth, wood-float finish without plastering. Finish square corners to 1/4-inch radius and other corners to radius shown.
- E. Height. Curb height shall be as detailed on the Drawings. Transition height at handicap ramp locations to meet level of drive and walk pavement.
- F. Protection. Remove no forms (except face forms) for 24 hours after placing concrete. Barricade against vehicular traffic 14 days and against pedestrian for 3 days. Compact thoroughly the backfill behind the curb.

3.04 CONCRETE WALKS AND PAVING

- A. General. Walks in City streets or in streets to be dedicated shall be constructed in accordance with the local agency having jurisdiction over the roadway impacted or in the absence of same, in accordance with the following specifications for all other concrete walks.
- B. Concrete walks shall be one course construction, reinforced concrete nominally 5-inches thick, but in no case less than 4-inches actual thickness, of widths shown on the Drawings. Edges of walks shall be formed adequately and braced to maintain alignment. Use flexible or curved forms for all curves in walks.
 1. Provide integral turn-down at walk edges where abutting bituminous paving as detailed.
 2. Slopes. Provide grade stakes not more than 25 feet apart for all walk construction. Check tops of forms for grade before placing concrete. Introduce short vertical curves in all walks as shown on the Drawings, or at points where change in walk grade exceeds 2%. For a distance of 2 feet from top and bottom of steps, walk slopes shall not exceed 2 inch per foot. Provide 1/4 inch per foot cross slope in the direction of natural drainage, and make slight adjustments in slopes at walk intersections as necessary or directed to provide proper drainage.
 3. Finish. Tamp and screed the concrete true to grade and section bringing sufficient mortar to the surface for finishing and give a wood or carpet- float finish, providing that where the walk grade exceeds 5%, the surface shall be given a belted or broomed finish as directed by the Engineer. Round all edges, including those along expansion joints and scored joints to a 1/4 inch radius. Where walks terminate at curbs, finish the walk 1/4 inch above the curb providing a neat bevel.
 4. Expansion Joints. Provide 2 inch transverse expansion joints with premolded filler not more than 50 feet apart, also at walk junctions and intersections, at top and bottom of steps and where walks abut curb returns, buildings, platforms, or other fixed structures, or terminate at curbs. Such expansion joints are not required (except for curb returns) between walks and contiguous parallel curbs. At walk junctions and intersections, the required expansion joints shall be located at the end of each rounding or fillet. Expansion joints shall be at right angles to the slab and extend the full depth thereof; the premolded filler shall extend to within 1/4 inch of the walk surface. Locate expansion joints in all walks as nearly as practicable opposite those in abutting curbs.

5. Scored Joints. Between expansion joints, cut grooves 1/8 inch to 1/4 inch wide, at least 3/4 inch deep, and with a spacing approximately equal to the walk width but not greater than 6 feet on centers.
- C. Handicap Ramp. Provide ramped sections for handicapped access where shown and as detailed. Ramp surface shall be given a uniform medium broomed finish at right angles to ramp pitch. Install tactile warning strip of width shown in Cobble II pattern as manufactured by Paverlock, Inc., of Cincinnati, Ohio.
- D. Other concrete paving at exterior areas shall conform to requirements shown on the Drawings.
 1. Provide reinforced concrete entrance area paving at Auditorium Building where shown. Thickness and dimensions shall be as detailed. Surface shall match grade of adjacent existing paving and finish spot grades as shown on the Drawings. The pad shall be given a uniformly textured finish to match existing paving.
- E. Protection. Remove no forms for 24 hours after pouring concrete. Protect concrete walks and paving from pedestrian traffic for a period of 3 days after pouring, and against vehicular traffic for a period of 14 days.

3.05 CONCRETE STEPS

- A. Concrete steps shall be constructed under work of this Section where shown and as detailed on the Drawings. Verify elevations at top and bottom landings prior to laying out formwork, excavation or preparation of subgrade.
- B. Excavation and Preparation of Subgrade. Excavate for corner posts to dimensions shown, and trim subgrade of concrete to required shape and slope. Footing excavations and subgrades shall be in a firm, moist condition, prior to placing any concrete, clean and free from loose material.
- C. Build forms to details shown on the Drawings, and so as to permit their removal without damage to the concrete. Place reinforcement as detailed, properly supported to maintain it in position during placing of concrete.
- D. Finish. Place concrete, and thoroughly compact it in the forms by means of spading, rodding, tamping or vibrating so as to thoroughly work into all corners and around reinforcement. All treads shall be pitched as detailed to drain, and shall be given a uniformly textured wood or carpet float finish. Exposed edges of treads shall be rounded smoothly to 2-inch radius. Remove face forms as soon as practicable, patch any surface voids with 1:2 mortar to match color of concrete, and rub with carborundum stone and water to a uniformly textured finish. Plastering of concrete surfaces will not be permitted.
- E. Protection. Do not open steps for use for seven days after concrete is placed.

3.06 BITUMINOUS PAVING

- A. General. All roadway and parking area pavement designated as bituminous shall consist of a crushed stone and dense graded aggregate base, and bituminous surface course. Refer to the Drawings for thickness of base, and surfacing, and total paving thickness.

- B. Subgrades shall be in accordance with applicable provisions of State Specifications. The subgrades shall be shaped to conform to the lines, grades, and cross sections indicated on the Drawings. All high areas shall be removed and all low areas shall be filled with approved material and compacted. Areas of yielding or unstable material shall be excavated and backfilled with approved material as directed by the Engineer. Compaction shall be to a uniform density throughout.
- C. Bituminous Surface
1. Surfacing shall be one-course bituminous concrete construction and in accordance with applicable provisions of the Kentucky Department of Highways Standard Specifications, Section 402. The surface course shall contain no aggregate larger than 2-inch. The surface mixture shall contain natural sand in the proportions of no less than 25 percent of the total combined fine and coarse aggregates.
 2. Surface course shall be of minimum thickness after compaction as shown on the Drawings.
 3. Thickness of bituminous surface and base shall be determined by coring of the newly constructed pavement in accordance with Kentucky Method 64-420-04, Paragraphs 1.2, 1.3, 2, and 3, with the following exceptions:
 - a. Coring frequency shall be 500 feet.
 - b. Exploratory cores for a deficiency shall be spaced at 100 foot intervals.
 - c. Excess thickness will be considered as included in the Contract price per square yard.
 - d. Deficient thickness between 2-inch and $\frac{3}{4}$ -inch will require a deduction from the unit price per square yard in the proportion of the actual thickness to the design thickness for the area of the deficiency as determined in accordance with the stipulated method. Deficient thickness of greater than $\frac{3}{4}$ -inch will require an additional 1-inch layer of surface to be overlaid over the area of the deficiency.
- D. Dense Graded Aggregate Base
1. Dense graded aggregate base shall be one-course construction and shall conform to the applicable provisions of the Kentucky Department of Highways Standard Specifications, Section 303. The base shall consist of graded aggregate no larger than 1 inch and water sufficient to provide the mixture with a satisfactory moisture content for compaction to a density of not less than 84 percent of the solid volume.
 2. Dense graded aggregate base shall be of minimum thickness after compaction as shown on the Drawings.
- E. Crushed Stone Base
1. Crushed stone base shall be one-course construction of No. 2 aggregate and shall conform to the applicable provisions of the Kentucky Department of Highways Standard Specifications, Section 302 for Gravel Base Type 1. The crushed stone shall consist of graded aggregate no larger than 3 inches and compacted to a minimum thickness as shown on the Drawings.
- F. A cut-back asphalt emulsion primer shall be applied to the dense graded aggregate base course prior to placing the bituminous surface course. Primer- L shall conform to the

applicable provisions of the Kentucky Department of Highways Standard Specifications, Section 407 for materials and application.

- G. Compact the subgrade of all pavement areas and place and compact crushed stone base, dense graded aggregate base, and bituminous surface course in conformance with applicable sections of the Kentucky Department of Highways Standard Specifications to the lines, grades and cross-sections shown on the Drawings.
- H. Signing: Construct signs for traffic control in areas as shown on the Drawings in accordance with the MUTCD, latest edition.
- I. Striping: Lay off and stripe parking areas and service road as indicated on the Drawings and in accordance with the MUTCD, latest edition. Provide cross-hatching, stop bars, and centerline stripes for roadway to limits shown on the Drawings. Cross-hatching and stripes shall be approximately 4 inches wide, stop bars shall be 24-inches wide, of lengths indicated. Paint materials shall be as recommended in State Specifications. Color shall be white.
 - 1. Provide painted lettering for "Stop" in location shown on the Drawings. Color shall be white and material shall be as specified above.
 - 2. Paint face and top of curbs in locations shown on the Drawings. Color shall be yellow and material shall be as specified above.

END OF SECTION 32 13 13

SECTION 32 31 13 CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Chain link fencing and gates.
2. Pipe bollards.

B. Related Specification Sections include but are not necessarily limited to:

1. Division 00 – Bidding Requirements, Contract Forms, and Conditions of the Contract
2. Division 01 - General Requirements.
3. Division 31 - Earthwork.
4. Division 03 – = Concrete.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. ASTM International (ASTM):
 - a. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - b. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 - c. A824, Standard Specification for Metallic-Coated Steel Marcellled Tension Wire for Use with Chain-Link Fence.
 - d. F552, Standard Terminology Relating to Chain Link Fencing.
 - e. F567, Standard Practice for Installation of Chain-Link Fence.
 - f. F626, Standard Specification for Fence Fittings.
 - g. F900, Standard Specification for Industrial and Commercial Swing Gates.
 - h. F1043, Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.
 - i. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
2. American Welding Society (AWS)
3. National Fire Protection Association (NFPA)
 - a. 70, National Electrical Code (NEC)
4. Underwriters Laboratories, Inc. (UL)

5. Federal Specifications
 - a. RR-F-183 Fencing Gates
 - b. RR-F-191A Fencing, Wire and Post, Metal Chain Link Fence Posts, Top Rails, and Braces
 - c. RR-F-221B, Fencing Wire

B. Qualifications:

1. Installer shall have a minimum of two (2) years of experience installing similar fencing
2. Utilize only AWS certified welders

1.3 DEFINITIONS

A. See ASTM F552

B. NPS: Nominal Pipe Size, in inches.

C. Installer or Applicator

1. Installer or applicator is the person actually installing or applying the product in the field at the Project site:
2. Installer and applicator are synonymous.
 - a. Fence and gate posts, rails, and fittings.
 - b. Chain-link fabric, reinforcements, and attachments.
 - c. Gates and hardware.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Scaled plan layout showing spacing of components, accessories, fittings, and post anchorage.
 - d. Mill certificates.
 - e. Source quality control test results.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The basis of design for the industrial coated chain link fence system is the Ameristar PermaCoat Color Chain Link Fence, the Master-Halco Spectra Series Chain Link Fence, or an approved equal. The color shall be black.

2.2 WARRANTY

- A. Fencing shall come with a 15 year warranty against defects, cracks, peeling, blistering, and fading.

2.3 COMPONENTS

A. Chain Link Fabric:

1. 2-inch mesh fabricated from 0.148-inch- (9 gauge) core diameter galvanized steel wire complying with Chain Link Fence Manufacturers Institute's "Product Manual." The galvanized steel wire shall be PVC-coated (Class 2A) to meet the requirements of ASTM F 668. The finished size of the coated wire shall be 7 gauge. The fabric height shall be 7'-0" unless noted otherwise.
2. Selvage treatment:
 - a. Top edge shall be knuckled.
 - b. Bottom edge shall be twisted.

- B. Framework: Polyester-coated Hot-dipped Galvanized Steel Pipe. Final coat shall be a "no mar" polyester coating. The framework shall endure a salt-spray resistance test in accordance with ASTM B117 without a loss of adhesion for a minimum exposure time of 3,500 hours. The color shall be black. Pipe sizes (minimum) are as follows:

1. Line or Intermediate Posts: 2.5-inch OD with a weight of 3.65 lb/ft.
2. End, Corner, and Pull Posts: 3-inch OD with a weight of 5.79 lb/ft.
3. Top Rails: 1.625-inch OD with a weight of 2.27 lb/ft.
4. Swing-Gate Posts: 4-inch OD with a weight of 9.11 lb/ft.
5. Swing-Gate Frames: 2-inch OD with a weight of 2.27 lb/ft.

- C. Fittings and Accessories: The coating for all fittings shall be same as required for the framework. The color shall be black. All fittings and accessories shall comply with ASTM F 626.

1. Post and Line Caps: Provide weathertight cap for each post. Provide line post caps with loop to receive tension wire or top rail.
2. Post Brace Assembly: Same material as top rail with 3/8-inch- diameter rod and adjustable tightener. Provide brace rail with truss rod assembly for each gate, end, corner, and pull post. Provide two brace rails extending in opposing directions, each with truss

rod assembly, for each corner and pull post. Provide rail ends and clamps for attaching to posts.

3. Bottom and Center Rail: Same material as top rail with cap on each end.
4. Tension or Stretcher Bars: Galvanized steel bar, 2 inches shorter than fabric height, 3/16 inch thick by 3/4 inch wide.
5. Tension Bands: 3/4-inch- wide galvanized steel bands, 0.074 inch thick.
6. Brace Bands: 3/4-inch-wide galvanized steel bands, 0.105 inch thick.
7. Tension Wire: 0.177-inch- diameter (No. 7 gauge), metallic-coated-steel marcelled wire with finish to match fabric.
8. Tie Wires: 0.106-inch- diameter, galvanized steel or 0.148-inch-diameter, aluminum alloy wire with finish to match fabric wire.
9. Barbwire: Provide three (3) strands of 12-1/2 gauge 4-point barbwire secured to 12" arms at top of fence. Barb arms shall be angled at 45-degrees away from the secured area. All barbwire items shall be finished to match fabric, except actual barbs.

D. Swing Gates: Comply with ASTM F 900. All framework, fittings, and accessories to be coated same as fencing framework and black in color. Fabric to be the same as described in section 2.1B and black in color. Provide coated galvanized hardware and accessories for each gate as follows:

1. Hinges: Non-liftoff type, offset to permit 180-degree gate opening.
2. Latch: Forked type or plunger-bar type, compatible with chain carrier.
3. Chain: Hot-dipped galvanized, then PVC-coated (black). Chain shall be a minimum of five feet (5') long and capable of receiving BEST padlock through any of the chain links.
4. Keeper: Provide a keeper for gates that automatically engages gate leaf and holds it in open position until manually released.
5. Gate Stops: For double gates, provide gate stops set in concrete, designed to engage a center drop rod or plunger bar. Include a chain carrier cutout permitting both gate leaves to be locked with a chain. Also include 4 lineal feet of 3/8" hot-dipped galvanized, then painted with black enamel, chain.

E. Pedestrian Gate Assembly:

1. Material same as fence material.
2. Latching mechanism shall include 'chain carrier' detail.

F. Pipe Gate Assembly:

1. Shall be schedule-40 steel, shop primed or hot-dipped galvanized, then painted with two coats of flat black enamel or epoxy in the field.
2. Chain shall be 3/8" hot-dipped galvanized, then PVC-coated (black). Chain shall be a minimum of five feet (5') long and capable of receiving BEST padlock through any of the chain links.
3. Welds shall be continuous and ground relatively smooth to receive coatings.
4. End caps and seal welds shall be included to provide weather-tight assembly.
5. All field welds shall receive a coat of zinc-rich primer and an additional coat (3 total) of paint.
6. For single gates over 12 feet long, hinge post shall be upsized to 6-inch diameter with mated upsizing of any internal posts or attachments as necessary.
7. Include chain carrier detail.
8. Include gate stop(s) with automatic latch/keeper.

9. Comply with detail in construction drawings. Match actual site dimensions.
10. Include attachment provisions for signage as necessary.

G. Pipe Bollards:

1. In-Ground Mounting Type:
 - a. Bollards shall be made of a 4-inch, Schedule 40 hot-dipped galvanized steel pipe.
 - b. Infill bollard with concrete.
 - c. Cap bollard with non-shrink grout with smooth dome top.
 - d. All exposed steel parts shall be:
 - 1) Primed, and then painted in OSHA Safety Yellow; or
 - 2) Powder coated in OSHA Safety Yellow.
 - e. See the Drawings for additional details.
2. Surface Mounting Type:
 - a. Bollards shall be made of a 4-inch, Schedule 40 hot-dipped galvanized steel pipe.
 - b. Cap bollard with welded, heavy gauge steel dome top.
 - c. Baseplate shall have holes factory drilled and be welded to the bollard pipe prior to painting.
 - d. All steel parts (pipe, baseplate, etc.) shall be:
 - 1) Primed, and then painted in OSHA Safety Yellow; or
 - 2) Powder coated in OSHA Safety Yellow.
 - e. Mounting hardware shall be stainless steel, 5/8" minimum, wedge-type anchor bolts per manufacturer's recommendation.
 - f. See the Drawings for additional details.

2.4 SOURCE QUALITY CONTROL

- A. Test related fence construction materials to meet the following standards:
 1. Posts and rails: ASTM F1043, Heavy Industrial

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with:
 1. Manufacturer's instructions.
 2. Lines and grades shown on Drawings.
 3. ASTM F567.
- B. Where fencing abuts property or easement lines, prior to installing fence, Contractor shall survey, stake and verify each property/boundary corner. Include a property/boundary line stake every 50 LF.

- C. Install fence to comply with ASTM F 567 to be plumb, level and adjusted for fit and finish. Gate hardware shall be adjusted for proper closure.
- D. Excavation: Drill post holes 9 inches in diameter and 36 inches in depth, equally spaced, but not more than 10 feet apart. Gate posts shall be spaced according to openings specified on the plans.
- E. Grading: Minor grading shall be performed to ensure a consistent gap between grade and the bottom of the fence fabric. Any holes or voids shall be filled with good quality topsoil and seeded in accordance with Division 32.
- F. Setting Posts: Set posts in holes approximately 4 inches (102 mm) above bottom of excavation. Align posts vertically and align tops. Pour concrete footings 2 inches (50.8 mm) above grade and trowel to a crown to shed water – no exceptions.
- G. Cleaning: The contractor shall clean the jobsite of excess materials. Post hole excavation spoils shall be disposed of off-site.
- H. Fabric: Install fabric on security side and attach with wire ties or clip to line posts at 14 inches on center, and to rails, braces and tension wire at 24 inches on center. Provide tension on fabric and barbwire that complies with Chain Link Fence Manufacturer’s Institute’s recommendations. The fabric shall be installed 3” above ground level.
- I. Repair and touch-up any marred or scratched coating and finish with matching coating or two coats of color-matched epoxy paint. If damaged area is larger than 10 square inches, the fence piece shall be rejected or sent back to the factory for repair.

END OF SECTION 32 31 13

**SECTION 32 92 00
RESTORATION OF LAWNS AND GRASSES**

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The work covered by this section shall include the establishment or restoration of all ground cover including areas to be seeded and/or sodded. This work shall include the supply of all materials, labor, superintendence and maintenance as outlined in these specifications.

1.02 RELATED WORK

- A. Division 31 "Excavating, Backfilling and Compacting for Utilities".
- B. Division 01 "Erosion and Sediment Control"

1.03 SCOPE OF THE WORK

Restoration of Fields, Lawns and Grasses by seeding and/or sod placement shall be performed on all areas which are not occupied by structures, roads, curbs and gutters, sidewalks, and concrete slab walls, etc.

1.03 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental Conditions or General Provisions and Division 01 Specification sections, apply to work of this section.

PART 2 - PRODUCTS

2.01 SEED

- A. The seed mixture furnished shall be in the following proportions:

Common Name	Proportion By Weight	Percent of Purity	Percent of Germination
Kentucky Bluegrass	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	05	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 and mixture.

2.02 SOD

- A. Sod shall be bluegrass or fine fescue sod strongly rooted and free of pernicious weeds. It shall be a uniform thickness of not more than 1-1/2 inches and shall have not less than 3/4 inches of soil. All sod shall be grown on a commercial turf farm and no pasture sod shall be acceptable. The source of the sod must be approved by the Engineer before it is cut for delivery.
- B. The sod shall be delivered and installed within 48 hours of being harvested by the producer.

2.03 FERTILIZER

A complete commercial fertilizer with a 1:2:2 ratio of nitrogen, phosphorus, and potassium shall be furnished. It shall be free flowing and suitable for application with approved equipment. The material shall conform to State fertilizer laws. Bagged fertilizer shall be delivered in sealed standard containers and shall bear the name, trademark, and warranty of the producer.

2.04 LIME

Lime shall be agricultural grade limestone crushed so that no less than 85% will pass a No. 10 sieve.

PART 3 - EXECUTION

3.01 SEQUENCE OF WORK

All finish grading in a general area shall be complete before fertilizing and seeding or sodding begins.

3.02 SOIL PREPARATION AND SEEDING

- A. The work consists of furnishing all labor, equipment, and materials in all operations in connection with the fertilizing and seeding of all the finished graded areas not occupied by structures, roads, concrete slabs, sidewalks, walls, etc., and including grassed areas destroyed or damaged by the Contractor.
- B. The areas to be seeded shall be thoroughly tilled to a depth of at least 4 inches by discing, harrowing, or other approved methods until the condition of the soil is acceptable to the Engineer or, in the event of work on an existing utility easement, to the satisfaction of the easement holder. After harrowing or discing, the seed bed shall be dragged and/or hand raked to finish grade.
- C. The incorporation of the fertilizer and the agricultural lime may be a part of the tillage operation and shall be applied not less than 24 hours nor more than 48 hours before the seed is to be sown. Fertilizer shall be applied at a rate to provide not less than 2-1/2 pounds of nitrogen, 5 pounds of phosphorus, and 5 pounds of potash per 1,000 square feet. Agricultural limestone shall be applied at a rate of not less than 100 pounds per 1,000 square feet.

- D. Seed shall be broadcast either by hand or approved sowing equipment at the rate of ninety pounds per acre (two pounds per 1,000 square feet), uniformly distributed over the area. Broadcasting seed during high winds will not be permitted. The seed shall be drilled or raked into a depth of approximately 1/2 inch and the seeded areas shall be lightly raked to cover the seed and rolled. Drill seeding shall be done with approved equipment with drills not more than 3 inches apart. All ridges shall be smoothed out, and all furrows and wheel tracks shall be removed.
- E. Seed may be sown during the following periods:
 - 1. February 1 to April 15.
 - 2. August 15 to October 15.
- F. Seed may not be sown at any other time except with the written approval of Owner.
- G. After the seed has been sown, the areas so seeded shall be mulched with clean straw at the rate of one bale per 2,000 square feet (approximately 1-inch loose depth). Mulch on slopes exceeding 20% shall be held in place with binder twine staked down at approximately 18-inch centers or by other equally acceptable means.
- H. 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 fertilize, seed, and mulch again as needed. Scattered bare spots up to one square yard in size will be allowed up to a maximum of ten percent (10%) of any area.

3.03 SOIL PREPARATION AND SOD PLACEMENT

- A. This work consists of furnishing all labor, equipment, and materials and all operations in connection with the placement of sod on all of the finished graded areas not occupied by structures, roads, concrete slabs, sidewalks, walls, etc., and including grassed areas destroyed or damaged by the Contractor.
- B. The areas where sod is to be placed shall be thoroughly tilled to a depth of at least 4 inches by discing, harrowing, or other approved methods until the condition of the soil is acceptable to the Engineer or, in the event of work on an existing utility easement, to the satisfaction of the easement holder. After harrowing or discing, the sod bed shall be dragged and/or hand raked to 1/2" below finish grade.
- C. The incorporation of the fertilizer and the agricultural lime may be a part of the tillage operation and shall be applied not less than 24 hours nor more than 48 hours before the sod is to be placed. Fertilizer shall be applied at a rate to provide not less than 2 1/2 pounds of nitrogen, 5 pounds of phosphorus, and 5 pounds of potash per 1,000 square feet. Agricultural limestone shall be applied at a rate of not less than 100 pounds per 1,000 square feet.
- D. Prior to the sod being placed, the area to be sodded shall be lightly watered to moisten the soil surface. The sod shall be carefully unrolled and trimmed to fit irregular areas, with the edges of the sod strips placed tightly together in such a manner as to conceal the joints between the

strips. Following placement, the sod shall be lightly watered (approximately a 1/4" application) and rolled with a medium weight lawn roller to minimize any ridging at the seams.

- E. Sod may be placed whenever the sod is not dormant, and the ground is not frozen or muddy. Sod may not be placed at any other time.
- F. For a period of first two weeks following placement, the sod shall be maintained by thoroughly watering the entire area covered by the sod every second day, with a 1/2" minimum application by sprinklers or a misting hose. Lawn watering gauges shall be used to measure the application. Flooding or sheet watering will not be allowed. For the third through sixth weeks following placement, the sod shall be maintained by thoroughly watering the entire area covered by the sod twice weekly (three to four days apart), with a 1/2" minimum application by sprinklers or a misting hose. Lawn watering gauges shall be used to measure the application. Flooding or sheet watering will not be allowed.
- G. Actual rainfall event amounts received during the period of watering may be counted towards the required application totals when the amount of the rainfall exceeds 1/4" per event.
- H. In the third through sixth week following placement, the Contractor shall maintain the sodded areas by mowing to a height of not less than three inches, prior to water applications. Contractor shall not allow sod blade height to exceed five inches during this period.
- I. Following the six-week watering period, the area covered by the sod will be rolled one additional time with a medium weight lawn roller, and shall be inspected by HCWD1 for acceptance.

3.04 RETORATION WARRANTY

All restoration work shall carry a warranty period of 18 months upon final acceptance of work. The Contractor shall repair and address all restoration items upon notification during the warranty period at no additional cost to HCWD1.

END OF SECTION 32 92 00

SECTION 33 09 10
INSTRUMENTATION FOR WATER UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

- A. This Division includes instruments used for monitoring and controlling water utility systems and facilities.
- B. Related Work Specified Elsewhere:
 - 1. Controls and operation of the Gray Lane Pump Station: Division 33 “Pump Controls”.
 - 2. Controls and operation of the Brizendine Booster Station: Division 33 “Packaged Pumping Systems”.

1.03 RELATED REQUIREMENTS:

- A. Division 26 “Electrical”.
- B. Division 33 “Groundwater Sources”.
- C. Division 33 “Packaged Pumping Systems”.
- D. Division 46 “Filtration Equipment”.

1.04 REFERENCE STANDARDS:

- A. National Fire Protection Association (NFPA):
 - 1. 70 – National Electrical Code (NEC).
- B. Instrument Society of America (ISA).
 - 1. S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
- C. Others as specified in applicable Sections.

1.05 SUBMITTALS:

- A. Submit as specified in DIVISION 01.
- B. Submit an action submittal for all products listed herein.
- C. Manufacturer with prime responsibility shall assume responsibility for all Compliance Submittals.
- D. As specified in each applicable Section, this Division.

1.06 QUALITY ASSURANCE:

- A. General:
 - 1. The Contractor shall coordinate with the OWNER’s System Integrator (SI).
 - 2. Products specified herein shall be integrated and compactable with the packaged control system they are a part of so as to provide and install a complete working package.
- B. System Integrators (SI):
 - 1. CONTRACTOR shall coordinate with OWNERS contracted (SI) for instrumentation signaling and SCADA compatibility. Action submittals will be forwarded by the Engineer to the SI for review and comment.

1.07 SEQUENCING AND SCHEDULING:

- A. Coordinate the installation of Equipment and Materials specified in this DIVISION with construction schedule.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All instrumentation shall be suitable for use with potable water.

2.02 PRESSURE

- A. Transducer and Transmitter:
 - 1. Shall be 316 Stainless Steel NSF 61/NSF 372 approved.
 - 2. 16-bit internal digital error correction for cost-effective low Total Error Band (TEB).
 - 3. Electrical: 40-20mA supply, 10...30 VDC, 4...20mA output.
 - 4. Operating range: 0 to 72 feet WC (minimum).
 - 5. IP68 protection rating, -10 to 60 °C operating temperature, -10 to 80 °C compensated temperature.
 - 6. Lighting protection included.×. Threaded NPT male connector.
 - 7. Manufacturer: Keller America "Valueline" or approved equal.
- B. Switch: With DC output, compatible with system controls, temperature, and pressure requirements. When tripped, pressure switch shall be capable of shutting off the pumps regardless of the pressure reading from the transmitter. Range = 0 to 250 PSIG (minimum). See controls and operation for initial setpoint.
- C. Gauge: Four-inch, glycerin filled ASME grade A, waterproof, and shock resistant stainless steel, gauges for indicating pipe pressure. Minimum Range = 0 to 250 PSIG (unless otherwise noted).
- D. All pressure sensors, switches, and gauges shall be installed with an isolation ball valve between the tap and the pressure device.

2.03 LEVEL

- A. Submersible Level Transducer
 - 1. Shall be 316 Stainless Steel NSF 61/NSF 372 approved.
 - 2. 16-bit internal digital error correction for cost-effective low Total Error Band (TEB).
 - 3. Electrical: 40-20mA supply, 10...30 VDC, 4...20mA +RS485 output.
 - 4. Operating range: 0 to 72 feet WC (minimum).
 - 5. IP68 protection rating, -10 to 60 °C operating temperature, 0 to 50 °C compensated temperature.
 - 6. Lighting protection included.
 - 7. Cable and Seals shall be PE and EPDM.
 - 8. Diameter: 0.75-inch maximum.
 - 9. Manufacturer: Keller America "Microlevel" or approved equal.
- B. Ultrasonic Level Sensor
 - 1. Shall be continuous, non-contact up to 40 feet range and monitor level and volume in liquids and slurries.
 - 2. Enclosure/Cable inlet shall be Plastic (PBT), 2-inch by ½-inch NPT.
 - 3. Range / Transducer material: PVDF Copolymer Process Connection: 2-inch NPT

- ((Taper), ANSI/ASME B1.20.1).
- 4. Communication / Output: 4-20mA.
- 5. Shall be compatible with current remote operation controls and/or SCADA systems operated by the Owner.
- 6. Model: SITRANS Probe LU Ultrasonic level transmitter 7ML5221-2BA14, shall match existing equipment for Filters Nos. 1-3.

2.04 FLOW

A. Flow Meter:

- 1. Accuracy: $\pm 0.4\% \pm 1$ mm/s
- 2. Maximum Operating Pressure: 250 psi
- 3. Material: Carbon Steel with corrosion resistant epoxy coating.
- 4. NSF/ANSI Standard 61 compliant.
- 5. Shall be compatible with current remote operation controls and/or SCADA systems operated by the owner.
- 6. Model: Shall match existing equipment for Filter Nos. 1-3:
 - a. Sensor: Siemens Sitrans FM MAG 5100 W (order no. 7ME6520-4VJ13-2AA2);
 - b. Transmitter: Siemens Sitrans FM MAG 5000:
 - i) For mounting with sensor: Order No. 7ME6910-1AA10-1AA0; or
 - ii) For remote mounting: Order No. 7ME6910-2CA10-1AA0.

2.05 MISCELLANEOUS

A. Turbidimeter:

- 1. Suitable for use measuring NTU of finished water effluent from a gravity filter in a potable water treatment plant.
- 2. Sensor shall measure 0 to 700 NTU.
- 3. Sensor accuracy shall be $\pm 2\%$ of reading ± 0.01 NTU from 0 to 40 NTU based on primary standard at 25°C.
- 4. Repeatability: Better than 1% of reading or ± 0.002 NTU on Formazin at 25 °C (77 °F), whichever is greater.
- 5. Sample flow: 100 to 1000mL/min.
- 6. Sample Pressure: Maximum 85 psi at 0 to 40°C and 40 psi at 40 to 60°C.
- 7. Sample Temperature: 2 to 60°C.
- 8. Manufacturer shall be Hach Model "TU5300" matching serial number "LXV445.99.53112". Shall match existing equipment for Filter Nos. 1-3.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify site conditions are suitable for installation of equipment and systems specified in this Division.

3.02 INSTALLATION:

- A. CONTRACTOR shall be responsible for all cabling terminations at instruments, control panels and devices supplied.
- B. Refer to Division 26 for additional cable termination requirements.

- 3.03 FIELD QUALITY CONTROL:
- A. Manufacturer's field services:
 - 1. As specified in each applicable Section, this Division.
 - B. Field Testing:
 - 1. General Requirements:
 - a. Conform to requirements as specified in DIVISION 01.
 - b. Conduct all tests in the presence of Engineer under the supervision of Equipment manufacturer's field engineer.
 - c. Notify Engineer two weeks prior to the commencement of all tests.
 - d. Include all tests recommended by the Equipment manufacturer unless specifically waived by Engineer.
 - e. Include all additional tests recommended by Engineer that he deems necessary because of field conditions, to determine that Equipment and Materials and systems meet requirements of Contract Documents.
 - f. Be responsible for all damage to Equipment and Materials due to improper test procedures or test apparatus handling.
 - 2. Test Reports:
 - a. Submit test reports as specified in DIVISION 01.
 - b. Maintain a written record of all tests showing date, personnel making tests, equipment or material tested, tests performed, and results.
- 3.04 TRAINING:
- A. CONTRACTOR shall provide formal training for operators, maintenance and service personnel.
 - B. A training schedule and log shall be developed. The training schedule shall identify scheduled dates and times for all training sessions specified in this DIVISION. The training log shall identify dates for training and record training session attendees.
 - C. Training sessions shall be scheduled with the Owner a minimum of two weeks prior to occurrence and a training schedule shall be maintained and communicated to the Owner on a routine basis.
 - D. Contractor shall professionally videotape all on-Site training for training purposes. Any charges for this videotaping shall be included.
 - E. Provide training as specified in each applicable Section, this DIVISION.

END OF SECTION 33 09 10

SECTION 33 09 30.01
PUMP CONTROLS - GRAY LINE PUMP STATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish and install all materials, equipment, and accessories, as required for the microprocessor based pump control system, including level control/alarm switches, and performing all operating tests and adjustments necessary to guarantee satisfactory system operation. The system includes all materials, labor, tools, fees, and documentation required to furnish, install, test and place in operation a complete and operable pump control system as shown and/or specified. The system shall include all measuring elements, signal converters, transmitters, local indicator panels, digital hardware, software, signal and data transmission systems, interconnecting wiring, conduit, and such accessories as shown, specified, and/or required to provide the functions indicated.
- B. The pump controls specified in this section shall be supplied by the pump supplier in Division 33 "Groundwater Sources". The variable frequency drives specified in Section 26 29 24 shall also be supplied by the pump control supplier.
- C. The pump control system supplier shall be responsible for interfacing all system components included in these Specifications with the pumps and variable frequency drives for the satisfactory operation of the complete, installed control system.
- D. The listing of specific products in this specification in no way relieves the Contractor of furnishing equipment which shall meet the performance and quality criteria specified herein.
- E. The contractor shall be responsible for all patents, licenses, fees, or claims because of the design, equipment, or assemblies used, and because of any special provisions or requirements which are inherent for proper operation of the equipment specified or required under this item.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Related sections:
 - 1. Division 01 "Product Requirements"
 - 2. Division 33 Groundwater Sources"
 - 3. Division 26, Electrical

1.3 SHOP DRAWING AND ENGINEERING DATA

- A. Submit complete shop drawings and engineering data to the Engineer in accordance with the requirements of Division 01 Submittals.
- B. The contractor shall supply, for approval by the Engineer, loop diagrams, pump control system panel layout drawings, panel wiring diagrams, instrumentation system interconnection diagrams, and detailed instrumentation equipment specification sheets or bills of material. In addition to printed and bound shop drawings, electronic PDF format submittals shall be supplied.
- C. Panel layout drawings shall include, but shall not be limited to, for each panel, a front view, side view(s), rear view, base plan (where applicable and subpanel layout(s)). The layout of devices on and within the panel shall be clearly shown with all devices identified. Panel mounting details shall be shown and overall dimensions shall be shown, plus all dimensions relative to mounting bolt locations, etc. Door swing arcs shall be shown on the panel base plans. Locations and sizing of cable and/or conduit entry areas shall be clearly shown.
- D. Panel wiring diagrams may be schematic in nature provided they follow J.I.C. schematic diagram format and clearly show all wire numbers, terminal point numbers, and contain sufficient notes and information to facilitate checking of drawings, test and maintenance of the system and its equipment, etc. The function of each relay shall be identified near that relay's coil on the schematic diagram. Cross reference relays and contacts.
- E. System interconnection diagrams shall include complete identification of all system interconnecting wires, cables, etc. This includes terminal numbers from the motor starting equipment, field control panels and field devices. System interconnection diagrams and panel wiring diagrams may be combined into one set of drawings, provided all details of both types of drawings are clearly and understandably incorporated and provided that field wiring may be easily distinguished from panel wiring.
- F. Pump control system supplier shall certify that all instrumentation system equipment and panels as built and installed conform to those parts of this specification dealing with shielding of signal circuits, grounding of shields and lightning protectors, EMI/RFI protection, etc.
- G. All drawings shall be prepared in such detail as to enable plant technical personnel to maintain, trouble-shoot, and repair the system without assistance of the system supplier's field service personnel.
- H. After all changes or corrections resulting from the Engineer's review of the system supplier's drawings have been made, panels may be built and instrumentation devices may be supplied in accordance with the approved drawings. One set of "as shipped" prints shall be included in the panels when shipped from the system supplier's wiring and assembly shop.
- I. After all field changes or corrections made during installation and field check-out have

been completed, then all system supplier documentation shall be revised to reflect the "as installed, corrected, and accepted" condition of the system and final record copies of all system supplier's documentation including instrument specification sheets and/or bills of material for the system shall be provided to the Owner and Engineer.

- J. Reproducible drawings and electronic CAD files of all instrumentation system drawings shall be supplied in accordance with the Contract requirements after "as installed" revisions have been made.
- K. Instruction manuals shall be supplied. Operating instructions shall also incorporate a functional description of the entire system including the system schematics which reflect "as-built" modifications. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures. Provide print out and electronic copy of program file and documentation. Each program element, e.g. input, internal coils, timers, counter, etc. to be assigned symbol name and description.

1.4 STORAGE AND PROTECTION

- A. Store and protect general controls and accessories in accordance with the requirements of Division 01.
- B. Special storage requirement:
 - 1. Store all mechanical and electrical equipment covered by this section in an enclosed warehouse at a minimum constant temperature of 60°F and a maximum humidity of 38 percent, from the time of receipt to the time of installation. Take special care to prevent dust or moisture contamination of electrical or electronic equipment.
 - 2. Do not deliver or install equipment until authorized in writing by the Engineer.

1.5 SHOP PAINTING

- A. Clean, shop prime, and shop paint control panels and accessories in accordance with the recommendations of the manufacturer and the requirements of Division 09.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit complete operation and maintenance data on the controls in accordance with the requirements of Section 01 78 23, Operating and Maintenance Data.

1.7 GUARANTEE

- A. Provide a guarantee against defective equipment and workmanship in accordance with the requirements of Section 01 78 37, Warranties and Bonds.

1.8 QUALITY ASSURANCE

- A. The Contractor's attention is directed to the fact that the control system shall be an integrated system and, as such, shall be furnished by a single approved supplier who shall provide all of the instruments, equipment, and appurtenances regardless of manufacture, and who shall be responsible to the Contractor for the complete and satisfactory operation of the entire control system.
 - 1. These specifications cover the intended functionality of the equipment, but do not necessarily cover all details necessary for a complete, operable and functional system. The control system supplier shall supply all devices and appurtenances necessary to provide a complete, operable and satisfactory system as indicated or specified.
 - 2. The Contractor shall be fully and solely responsible for the work of the control system supplier and solely responsible to the Owner for having supplied a complete control system.

PART 2 - PRODUCTS

2.1 SINGLE SUPPLIER

- A. A single supplier shall furnish all components of the pump station control system. The supplier's experience must include equipment of comparable type and size in successful operation for not less than three years. Components shall be of U.S. manufacture with parts and service available within 100-mile radius of Radcliff, KY. Components shall be sourced from the local distributor, within Kentucky and a 100-mile radius of Radcliff.

2.2 GENERAL EQUIPMENT REQUIREMENTS

- A. All equipment shall be the latest and proven design. Specifications and Drawings call attention to certain features, but do not purport to cover all details entering into design of the control system. The completed system shall be compatible with functions required and the equipment furnished by the Contractor.
- B. All electrical control components of the system shall operate on 120 volt, single-phase, 60 Hz power source, except as otherwise noted in the Specifications. Drawings and Specifications indicate the energy sources that will be provided. Any other devices necessary to obtain proper operation of the instrumentation system from these energy sources shall be furnished with the instrumentation.
- C. All necessary fuses or switches required by the instrumentation manufacturer for his equipment shall be provided with the equipment. All instruments requiring internal power supply shall have internal on-off switches. Fusing requiring 5mm and 1/4" diameter fuses to be placed in DIN rail mounted fuse block.

- D. Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.
- E. Purchase any and all software packages required for the system in the name of the Hardin County Water District No. 1. All warranties associated with the hardware and software shall be in the name of the Hardin County Water District No. 1.

2.3 SIGNAL COORDINATION

- A. The Control System Supplier shall be responsible for coordinating signal types and transmission requirements between the various parties providing equipment under this Contract.
- B. The Control System Supplier shall provide 24 volt power supplies for signals and instruments where applicable and as required inside panels, controls, etc. Where two-wire instruments transmit directly, the control system supplier shall provide power supplies for those instruments. Where four-wire instruments with on-board loop power supplies transmit directly, the control system supplier shall provide necessary signal isolators or shall otherwise isolate the input from the I&C system loop power supply. Similar provisions shall be made when a third element such as a recorder, indicator or single loop controller with integral loop power supply is included in the loop.
- C. Analog signal transmission between electric or electronic instruments, controllers, and all equipment and control devices shall be individually isolated, linear 4-20 miliamperes and shall operate at 24 volts DC. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating. All cable shields shall be grounded at one end only, at the control panel, with terminals bonded to the panel ground bus or through the surge suppressor where specified. Analog signal isolation and/or conversion shall be provided where necessary to interface with instrumentation, equipment controls, panels and appurtenances.
- D. Non-standard analog transmission systems such as pulse duration, pulse rate, and voltage regulated shall not be permitted except where specifically noted in the Contract Documents. Where transmitters with nonstandard outputs do occur, their outputs shall be converted to an isolated, linear, 4-20 milliampere signal.
- E. All discrete inputs to equipment from field devices, starters, panels, etc., shall be dry contacts in the field device or equipment, powered from the controller, unless specified otherwise. Sensing power supplied shall be 24 VDC.
- F. All discrete outputs from control panels to field devices, starters, panels, etc., shall be 24 VDC powered (sourced) from the controller. Controller powered discrete outputs shall energize 24 VDC pilot relay coils in the field devices, starters, panels, etc. which in turn open or close contacts in the associated control circuit. The 24 VDC relay coil, contacts, and associated control circuitry shall be furnished integral with the field device, starter, panel, etc. by the supplier and contractor furnishing the field device, starter, or panel.

Where required or specified herein, discrete outputs from equipment to field devices, starters, panels, motor operated valves, etc., shall be dry contact or relay outputs.

- G. Other discrete signals between starters, panels, etc. where no 24 VDC power supply is available may be 120 VAC, as long as such contacts are clearly identified in the starter, panel, etc. as being powered from a different power supply than other starter/panel components. Where applicable, warning signs shall be affixed inside the starter, panel, etc. stating that the panel is energized from multiple sources. Output contacts in the starter, panel, etc. which are powered from other locations shall be provided with special tags and/or color coding. Disconnecting terminal strips shall be provided for such contacts. The above requirements shall apply to all starters and panels, regardless of supplier.

2.4 PROCESS CONTROL

- A. Where setpoints, operating limits, and other control settings are provided by the functional descriptions, these settings shall be initial settings only and shall be used for assistance in the initial startup. All such settings shall be fully adjustable and, based on actual operating conditions, the control system supplier shall make all necessary adjustments to provide smooth, stable operation at no additional cost to the Owner.
- B. Provision shall be made in the pump control panel to suppress nuisance alarms and control actions by the following means:
 - 1. For alarms and control actions derived from analog input signals, use adjustable time delays and deadbands.
 - 2. For alarms and control actions derived from discrete input signals, use adjustable time delays.
 - 3. Initial settings for time delays shall be 10 seconds (range 0-120 seconds). Initial settings for deadbands shall be 5% of span (range 0-100%).
- C. All setpoint control shall be by PID control algorithms. Where only proportional control is specified, tuning constants shall be used to reduce the Integral and Derivative functions to zero. All setpoints, sequence times, sequence orders, dead bands, PID tuning parameters, delay timers, variable speed operating range limits, and similar control constants shall be accessible and alterable from the operator interface.
- D. All equipment shall be provided with adjustable start and stop delays. Unless otherwise specified, these delays shall be initially set at one minute. Unless otherwise specified, all equipment shall automatically restart after a power failure utilizing adjustable start delay timers. Unless otherwise specified, all control strategies shall be based upon automatic restart after a power failure and shall return to a normal control mode upon restoration of power.

- E. Equipment failure shall be generated through the controller for any drive, motor, etc. for which a run command has been issued, but for which the controller is not receiving a run status signal.
- F. Instrument failure shall be generated via the operator interface for any instrument which is generating a signal which is less than 4 mA or greater than 20 Ma.
- G. Failsafe. Pump control hardware and programming shall be utilized to obtain failsafe operation. Pump control system shall be designed such that a controller failure or primary control failure shall not cause a failure of pump operation. Under these conditions, pump operation shall be via redundant relays, alternator, and level instrument.

2.5 PUMP CONTROL SYSTEM

- A. Pump control system as specified herein or shown on the Drawings shall include but not be limited to pump control panel with a PLC based control system. The control system shall be sized for and capable of controlling the well water system and suitable for PID control to accomplish a constant automatic pump operation should SCADA not be available.
- B. Wiring. All single end wiring shall have not less than 600-volt insulation and all power wiring and bus shall be in complete conformity with the National Electric Code, state, local, and NEMA electrical standards. All wiring to be tinned stranded copper with type MTW insulation, no nylon pulling jacket. All job connections required to conveniently replace control components shall be made at approved type terminal blocks with engraved bakelite marker strips or similar approved means. All wiring shall have wire numbers corresponding to the wiring schematics and diagrams. Color coding of the wiring is to be consistent with NFPA 79 section 13.2. Specifically use:
 - 1. Green: equipment grounding
 - 2. Black: ungrounded AC or DC power conductors
 - 3. Red: ungrounded AC control conductors
 - 4. Blue: ungrounded DC control conductors
 - 5. White: grounded (current carrying) AC conductor
 - 6. White/Blue Stripe: grounded (current carrying) DC circuit conductor
- C. Individual components shall be UL listed. In addition, control panel shall be UL 508 listed as an assembly.
- D. Enclosure:
 - 1. For Base Bid: The Pump Control Panel shall be UL/ NEMA 3R, 304 stainless steel electrostatically painted white.
 - a. Provide deadfront type enclosure with 3 point latching key locking

handles. The frame of the enclosure will be made of 16 fold rolled stainless steel, robotically welded closed frame design for maximum strength. The back panel shall be made of 11 gage galvanized steel and be rolled in a C shape on each side for extra strength. The roof of the enclosure shall have foamed in place gasket and be fixed with detachable eyebolts. Enclosure doors shall have a minimum opening radius of 130 degrees and have foamed in place gasket. An 8" plinth with mounting feet shall be supplied along the bottom of the enclosures to allow for entrance of the pump and control sensor cables. The enclosure shall have a pan that is removable from the top side for ease of installation. Control panels and controls for soft starters shall be mounted in the deadfront of the enclosure. Enclosure shall be EcoSmart ArcArmor type equipped with separate compartments to separate 480V equipment with low voltage equipment in the station. Provide security door contacts to send a signal to SCADA is any door is opened.

- b. Flanged breaker disconnects interlocked with inner doors shall be supplied for each starter section. Properly sized copper cable bus shall be supplied along the top side of the enclosures with ground bus across the bottom. Climate control shall be installed on the front doors to maintain proper temperature of the solid state equipment, when required.
2. A properly sized Service Entrance main breaker shall be supplied for the bottom feed incoming power. The breaker will be cable bus connected to the rest of the system and be rated at 42kAIC. The main breaker will be a LSI electronic trip type circuit breaker, 400Amp Square D Powerpact or equal.
3. The system shall include a 3-phase cable bus system rated at 600 volts AC at 60 hertz and have a current carrying capacity of 400 amps.
4. Motor breakers shall be LSI electronic trip unit rated at 35kAIC minimum, Square D Powerpact or equal. Breakers shall be indicating type, providing "on-off-tripped" positions of the handle. They shall be quick make-quick break on manual and automatic operation.
5. Each motor shall have its own breaker disconnect with a flanged mounted interlocking handle. The breaker shall be hard wired into the cable bus.
6. As part of Base Bid: a Variable Frequency Drive (VFD) shall be provided for each motor. See Section 26 29 24 for VFD requirements.
7. An air conditioner shall be supplied to maintain proper temperatures in the enclosures. It shall include the following features and maintain the enclosure ratings:
 - a. Front key pad mounted operation with digital LED temperature readings.

- b. Fault contacts on motor over temperature for remote monitoring.
- c. Door limit switch to shut the air conditioner down when the door is opened.
- d. Air conditioners will be protected by a properly sized breaker disconnect.
- e. Supply voltage to the air conditioner shall be 460v eliminating the requirement for voltage reducing transformer.

E. Components:

1. The pump control panel shall contain the features as shown on the Drawings and/or specified hereafter.
2. Pilot devices such as indicator lights, pushbuttons, and selector switches shall be heavy-duty, oil-tight, NEMA 4.
3. All conduits, fittings, or connections shall enter the enclosure through the bottom only. Locate the incoming power terminal block at the bottom of the enclosure to facilitate bottom conduit entry and ensure sound electrical integrity of the incoming power connections.
4. Supply an internal condensation heater with adjustable thermostats in the control panel.
5. Furnish a non-reset running time meter measuring hours and tenths of hours of operation up to 99999.9 hours for each pump motor indicated. This shall be a 120-volt AC device operating from the control voltage by an auxiliary contact of the motor starter.
6. Run lights for each pump.
7. PLC based primary well level control system as specified herein.
8. Submersible level transducer for monitoring the well level as specified herein.
9. Provide panel mounted universal power supply (UPS) for 120-Volt control power. Minimum 850 VA, Sola, or Engineer approved equal.
10. Provide alarm system with appropriate relays and LED alarm lights (with Lamptest button) to annunciate the following on the panel:
 - a. low well level
 - b. pump fail to start or run, seal failure, and over temperature (one common

light each pump)

11. Provide alarm reset and test pushbuttons. Connect common alarm signal to external red flashing alarm light. The external alarm light shall be provided in a NEMA 4X enclosure and mounted on top of pump control panel.
12. Provide LED light fixture with globe and guard inside the control panel. Provide automatic, door activated switch.
13. An arc flash warning label against electric shock shall be permanently affixed to the outer door. Provide per NFPA 70E indicating proper working distances and personal protective equipment. See specifications section 260573 Coordination Study for additional information.
14. All components shall have permanently engraved identification tags.
15. Provide 10KVA, 480V to 120/240V, 1-phase transformer and 60A, 120/240V, 1-phase panelboard in pump control panel to serve miscellaneous loads such as exterior lighting, service receptacles, and Existing SCADA. See drawings for panelboard configuration and breakers.
16. Rate all components and wiring within the control panel to withstand available utility fault current.
17. The control panel shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage caused by phase reversal, phase loss, high voltage, low voltage, and voltage unbalance. An adjustable time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart, following an adjustable time delay, when power conditions return to normal. Diversified Electronics SLA series or equal.

2.6 PLC CONTROLLER

- A. The logic for the Pump Control Panel shall be provided by a PLC mounted inside the control panel.
- B. All equipment and materials shall be new, unused and proved by previous use of similar products to be completely suitable for the service intended.
- C. All electrical components of the system shall be powered by 120 volt, single phase, 60 cycle alternating current, except as otherwise indicated or specified.
- D. All contacts for control, remote motor operated, or electrically operated equipment shall be rated not less than 10 amperes on 120V unless otherwise specified herein.

- E. All systems and individual components, whether panel or field mounted units, shall be protected from voltage and/or current surges which may originate as a result of lightning or other external causes.
 - 1. Protective equipment to be provided by the control system supplier and installed in accordance with his recommendations.
 - 2. Schematics of the instruments submitted for approval to the Engineer shall indicate how this protection will be provided and identify the items of equipment which shall be used for this purpose.

- F. The Instrumentation and Control System Integrator shall supply “as-built” drawings containing all necessary information for proper maintenance and operation of the system.
 - 1. Wire log table showing connections (wire terminations) between all furnished components to be supplied to facilitate field wiring.
 - 2. Interconnection information between system components and equipment found in other sections of these Specifications shall be complete with all necessary interconnection information.
 - 3. Notes which refer to equipment manufacturer’s drawings for proper interconnection will not be acceptable.
 - 4. Provide within 30 days after startup and after any field modifications.

2.7 PLC BASED PUMP CONTROL PANEL HARDWARE

- A. General:
 - 1. The pump control panel shall be constructed using “off-the-shelf” programmable logic controllers (PLCs), surge arrestors, relays, power supplies, and enclosures as required for a fully functioning and fully operational system.
 - 2. All field wiring terminations shall be made to terminal strips capable of accommodating up to #12 AWG wire. Terminal strips shall be mounted using DIN rails. Terminal strips shall be as manufactured by Phoenix Contact, Allen-Bradley, Square D or equal. Printed labels shall be used to designate terminal numbers for each terminal.
 - 3. A limit switch shall be mounted on the door of the Pump Control Panel enclosure. The limit switch shall be wired to a non-relay-isolated input of the Pump Control Panel to provide a “Door Open” signal.

4. The PLC shall be programmed by the Pump Control Panel supplier to maintain all equipment run-times, analog signal hourly averages, minimums, and maximums.
5. The programmable logic controller (PLC) for the control system be the Allen-Bradley Micrologix's 1400 PLC.

B. Input/Output (I/O) Requirements:

1. As a minimum, each PLC-based Remote Telemetry Unit (RTU) shall be supplied with the following minimum I/O complement:
 - a. 20 Digital (discrete) Inputs
 - b. 12 Digital (discrete) Outputs
 - c. 4 Analog Inputs (4-20 mA)
 - d. 2 Analog Outputs (4-20 mA)
 - e. Additional I/O shall be supplied using 1762 I/O modules if required to meet the required functionality.
2. All analog inputs, including spare analog inputs, shall be protected from surges using three stage surge/transient suppression devices. The first level of protection shall be via a 1/4 Amp 3AG size fast acting fuse. Secondary and tertiary protection shall be fulfilled using a combination of three terminal gas discharge tube and metallic oxide varistor (MOV) surge protection with current limiting resistors. Terminals shall be installed adjacent to the analog surge protection devices to provide convenient access to 24 VDC for connections of future 2-wire transmitters. Additional terminals or jumpers shall be installed to allow each of the four analog inputs to be configured to produce one 4 to 20 mA or 1 to 5 VDC signal to the PLC plus one auxiliary output signal connected to terminals to drive an additional or future digital display or signal conversion device.
3. All digital inputs, including spare digital inputs, shall be isolated via electro-mechanical relays. Minimum contact rating for relays shall be 10 Amps at 250 VAC. Digital inputs isolation relays shall be connected to field wiring via DIN rail mounted terminal strips. A 2 Amp 3AG size fuse installed in an indicating fuse holder shall protect the 24 VDC power supply for all digital inputs. A minimum of eight (8) relays shall be provided and shall be fully wired to eight (8) of the sixteen (16) available digital inputs. Additional digital inputs shall be wired via interposing relays if required to accommodate additional digital field input signals.
4. Digital Input #8 shall be dedicated to monitor AC power failure for the Pump Control Panel.

5. Digital Input #9 shall be dedicated to monitor Low Battery power condition of the uninterruptible power supply (UPS) system.
6. Digital Input #10 shall be dedicated to monitor the limit switch mounted on the door of the Pump Control Panel enclosure.
7. Digital outputs shall be isolated from field wiring through terminal strips and electro-mechanical relays with minimum contact ratings of 10 Amps at 250 VAC. A minimum of four (4) relays shall be provided and shall be fully wired to four (4) of the available digital outputs. Additional outputs shall be wired via interposing relays if required to accommodate additional digital field output signals.
8. An operator interface shall be supplied for the pump control panel. The operator shall be at minimum 3.8 inches. The LCD display shall be a PanelView Plus 6 Compact Terminal, Touch Input Type, 5.7 in Display Size, Color Display Type, Ethernet and RS232 communication with DC Power Input as manufactured by Rockwell Automation or pre-approved equivalent.

2.8 CONTROL FUNCTIONALITY

- A. The station control program that will be utilized in the PLC will be provided to the system integrator for installation into the PLC hardware for this project. The utility district owns the license to this program and it is used system wide in the district for lift station control.
- B. Pump primary control shall be based on operator inputs received via SCADA. These include:
 1. Pump ON/OFF.
 2. Pump speed: minimum to full.
- C. Pump secondary control - Initiate automatic secondary control if SCADA input is not being received or not functioning.
 1. Pump shall be called to run automatically at minimum speed until input from SCADA is restored.
- D. Low Water Level Control - Override all other controls sequences, except HAND operation, with the following:
 1. Pump stopped if submersible level transducer measures a Low Water Alarm Level and falling. See "Proposed Well Profile Detail" on Drawing Sheet D1.02 for initial setpoint.

2.9 WELL LEVEL CONTROL SYSTEM

- A. An automatic PLC based pump control system shall operate the pumps in accordance with operator input received via SCADA. The automatic control system shall adjust pump on/off and speed based on operator input from SCADA, a submersible level

transducer to monitor level.

- B. Controller shall be connected to the new SCADA RTU (by others) which will be installed adjacent to the pump control panel. Provide control inputs and outputs from the controller to the RTU as follows:
1. Well level
 2. Low level alarm
 3. Pump 1 amps
 4. Pump 1 status
 5. Pump temperature alarm
 6. Pump 1 run time
 7. Pump 1 speed feedback
 8. Pump 1 speed command
 9. Pump 1 Call to run
 10. Communication failure
 11. AC power failure
 12. Control panel door open
- C. Submersible Level Transducer
1. Shall be 316 Stainless Steel NSF 61/NSF 372 approved.
 2. 16-bit internal digital error correction for cost-effective low Total Error Band (TEB).
 3. Electrical: 40-20mA supply, 10...30 VDC, 4...20mA +RS485 output.
 4. Operating range: 0 to 72 feet WC (minimum).
 5. IP68 protection rating, -10 to 60 °C operating temperature, 0 to 50 °C compensated temperature.
 6. Lighting protection included.
 7. Cable and Seals shall be PE and EPDM.
 8. Diameter: 0.75-inch maximum.
 9. Manufacturer: Keller America "Microlevel" or approved equal.
- D. Pressure Gauge
1. Four-inch, glycerin filled ASME grade A, waterproof, and shock resistant stainless steel, gauges for indicating system suction and discharge pressure. Minimum Range = 0 to 250 PSIG.
- E. All pipe mounted pressure sensors, switches, and gauges shall be installed with an isolation ball valve between the tap and the pressure device.
- F. Furnish, install, and wire the transducer as shown on the Drawings. Mount transducer inside a stilling well as noted on the Drawings. Attach transducer and cables so as to not interfere with the removal of pump.
- G. Continuous control cords must be used for the pressure transducer to the junction box.

2.10 CONTROL AND INTERPOSING RELAYS

- A. In general, relays shall be din rail mounted 11 pin round plug in octal style relays supplied with 24 VDC coils and at a minimum, 3PDT contacts rated at 10 A, 120 VAC or 24 VDC. Where required for a specific function, relays may be provided with 120 VAC coils. Relays with 24 VDC coils shall have different sockets than 120 VAC coil relays.
- B. Relays shall be provided with clips for attachment to sockets and indicator lights which glow when the relay coil is powered. Include plug-in modules.
- C. Relays shall be as manufactured by Phoenix Contact Inc., PR3 Series, or Engineer approved equal.

2.11 TRANSIENT SURGE ARRESTERS

- A. All field signal circuits, including all wiring outside of buildings and between buildings, shall be protected by lightning arresters, at both ends of each field wire run, which are mounted in control panels, termination panels, or inside of outdoor enclosures for field instruments or analyzers.
- B. Panel-mounted protectors shall be of the type which is made for mounting on a terminal block rail. Each arrester shall include a moveable grounding link to allow each signal cable shield to be individually grounded to the panel via the mounting rail through the lightning arrester for that cable without the use of any additional grounding wire, or to be isolated from ground at the arrester. Each such mounting rail shall be grounded to the panel by the use of rail mounting screws at approximately one-foot intervals. Protection shall be from line to line and from each line to ground. Protection shall also be from shield to ground where the shield is not grounded at the protector. Each arrester shall have the ability to protect against surge currents greater than 10,000 amperes. Each arrester shall add no more than 22 ohms per signal wire to the total signal loop resistance of the analog signal loop in which it is installed. Lightning arresters shall not introduce error-producing ground loop currents into the instrumentation signal circuits.
- C. Rail-mounted lightning arresters shall be Phoenix Contact Inc., Plugtrab PT Series, or Engineer approved equal. Discrete circuits shall be 4x1. Analog circuits shall be 1x2.
- D. Signal circuit lightning arresters for field instruments shall also be the same as those described above for mounting in panels and shall be mounted within the field instrument enclosures or housings where practical. Where such mounting is not practical, then these arresters shall be mounted in NEMA 4x enclosures located at the field devices.
- E. AC line lightning arresters shall be provided for all cabinets and enclosures and for all field instrumentation devices and analyzers which require AC power. These arresters shall be enclosed in moisture-proof housings. The arresters shall be mounted inside the enclosure of the field equipment where practical for field devices. In other locations, the arrester shall be mounted immediately adjacent to the protected device. Each arrester shall have the capability to withstand repeated surge currents of at least 20,000 amps

peak at 8 x 20 microsecond wave. Performance shall be equal and reliable for surges of either polarity.

- F. AC line arresters shall be Phoenix Contact Inc., MAINS-PLUGTRAB PT Series, or Engineer approved equal.
- G. A mainpower TVSS shall be provided, IT Protector PTE160, or Engineer approved equal.

2.12 INTRINSIC BARRIERS

- A. Intrinsic barriers shall be Phoenix Contact Inc., Process Interface ME Series, or Engineer approved equal.

2.13 FACTORY TESTING

- A. Factory test the complete pump control system before shipment. This shall consist of powering of all circuits, testing all instrument loops, control functions, failsafe, and alarm functions. Test results shall be certified by the control system supplier. Representatives of the Owner may witness the tests if they so desire. Provide a 10-day advance notification of factory test to the Engineer.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Enclose and protect all equipment during shipment, handling, and installation. Packing and enclosures shall be proof against environmental and mechanical damage.
- B. All equipment surfaces shall be protected against impact, abrasion, or other degradation following installation.
- C. Any equipment found to have rust, corrosion, or other damage at the time of installation shall be required or replaced at the Engineer's discretion and at no cost to the Owner.

3.2 INSTALLATION

- A. The controls and accessories shall be installed, tested, and adjusted in accordance with manufacturer's recommendations, installation drawings, and DRAWINGS.
- B. Make all electrical connections in accordance with Division 26 - Electrical.

3.3 WIRING AND GROUNDING

- A. The following wiring practice guidelines shall be used in order to minimize ground

loops, to minimize electromagnetic interference/radio frequency interference (EMI/RFI) to this equipment, and to provide maximum practical immunity from damage resulting from lightning-induced transients.

1. Common wires or conductors shall not be utilized (either within panels or external to panels or for grounding of field devices) for both signal shield or signal grounding and for safety grounds.
2. Exposed wire lengths extending from within shielded signal cables shall be minimized to reduce pick-up of EMI/RFI by signal circuits. Exposed lengths of less than one inch are preferred, and a maximum exposed length of two inches may be permitted where necessary. No splicing of signal wires is permitted.
3. Signal wiring within outdoor or indoor field device enclosures shall conform to the same requirements as panel wiring.
4. Each signal cable shield shall be grounded at only one point, as indicated on the instrumentation system drawings. In general, grounding of signal cable shields shall be done at the control panel end. The signal cable for no signal shall share a common cable shield grounding wire with the signal cable shield for any other signal, and shall not share a common grounding wire with any other circuit. The length of no signal cable shield grounding wire shall not exceed two inches, with less than one-inch maximum length preferred.
5. All field signal wiring shall be protected at both ends by the use of lightning arresters. Arresters mounted in control panels, field termination panels, or in outdoor instrument enclosures shall be directly and individually grounded to the metal of the cabinet or enclosure. Where outdoor instrument enclosures are not metal, a common ground shall be established within the enclosure for lightning protection and for safety grounding either by the use of a metal grounding plate or by a heavy wire.
6. All outdoor instruments and all outdoor enclosures shall be grounded using the practice defined in Chapters 250, 500, and 800 of the National Electric Code.

3.4 START-UP AND OPERATION

- A. Coordinate system start-up and testing with the Owner and the Engineer.
- B. Provide factory service personnel for the start-up of the complete control system. Include verification of all factory installed parameters for performance of the pump control system and associated field instrumentation. The manufacturer's service department shall provide a minimum of 2 days, 2 trips, of training for Owner's personnel.

3.5 FIELD TESTS

- A. Test each control unit under actual operating conditions to show that each unit operates satisfactorily to the owner and engineer. Test all alarm, failsafe, and pump protective functions.
- B. Allow Engineer to observe field tests. Give ten day's written notice to Engineer before performing tests.
- C. Successful operation shall be demonstrated to the satisfaction of the Engineer. Make all necessary changes, modifications, and/or adjustments required to assure satisfactory and efficient operation (at Contractor's expense).
- D. Control system supplier's authorized representative shall provide a written report to the Engineer noting that the control system has been installed in accordance with manufacturer's recommendations, is in conformance with project performance requirements, and is ready for operation.

END OF SECTION 33 09 30.01

SECTION 33 11 00 GROUNDWATER SOURCES

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. Well Pump.
2. Drilling and casing for water well.
3. Intake screen.
4. Pump and casing Accessories.
5. Water and system testing and certification.

B. Related Requirements:

1. Division 26 “Pump Controls – Gray Lane Pump Station” for instrumentation and controls.
2. Division 26 Electrical for general requirements.
3. Division 31 Earthwork.
4. Division 33 Utilities.

1.3 DEFINITIONS

- A. Suspended Solids: Small solid particles that do not dissolve in water.

1.4 REFERENCE STANDARDS

- A. ASTM A48 – Gray Iron Castings.
- B. ASTM A53/ (A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless).
- C. ASTM C150/C150M - Standard Specification for Portland Cement.
- D. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- D. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- E. ASTM D5789 – Standard Practice for Constant Drawdown Tests in Flowing Wells for Determining Hydraulic Properties of Aquifer Systems.
- F. ASTM D6034 – Standard Test Method for Determining the Efficiency of a Protection Well in a Confined Aquifer from a Constant Rate Pumping Test.

- G. ASTM A580 – Standard Specification for Stainless Steel Wire.
- H. AWWA A100 - Water Wells.
- I. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
AWWA E101 – Vertical Turbine Pumps – Line Shaft Type.
- J. American Concrete Institute.
- K. Electrical Standards: See Division 26.
- L. Hydraulic Institute for line shaft turbine pumps.
- M. Kentucky Administrative Regulation (KAR) Title 401, Chapter 6 “Water Wells”.
- N. NSF/ANSI 61 – Drinking Water System Components.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittals.
- B. Well Drawdown Test: Reference Part 3 of the Section for requirements.
- C. Existing Well Assessment: Reference Part 3 of this Section for requirements.
- D. Product Data:
 - 1. Submit manufacturer information regarding well pump and controller, including rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
 - 2. Submit manufacturer information regarding well casing and accessories listed herein.
 - 3. For the well screen the manufacturer shall provide a submittal and schematic drawing of the proposed screen design. The documents shall include the OD, ID, construction materials, slot size, approximate weight per foot, wrap-wire length, wrap-wire height, collapse strength, percent open area, inlet open area per foot, transmitting capacity per foot, number of support rods, diameter of support rods, total cross sectional rod area, material yield strength, tensile strength, column load and recommended hang weight.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer Instructions:
 - 1. Submit detailed instructions on installation requirements, including storage and handling procedures.
 - 2. Indicate rigging and assembly.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections. See also Part 3 “Inspections” for tests and documentation required.
- H. Qualifications Statements:
 - 1. Submit qualifications for manufacturer and drilling firm.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 77 00 - Project Closeout

- B. Project Record Documents: Record actual locations of well, depth, subsoil strata, and drilling difficulties encountered.
- C. Submit signed copy of driller's log book statements.
- D. Submit executed certification of well pump after performance testing.
- E. Submit documents required by Kentucky Division of Water.

1.7 QUALITY ASSURANCE

- A. Perform Work according to AWWA A100.
- B. Perform Work according to Hardin County Water District No. 1 and Kentucky Division of Water standards.
- C. Maintain a copy of the construction documents affecting Work of this Section on Site.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three (3) years documented experience.
- B. Drilling Firm: Company specializing in performing Work of this Section with minimum three (3) years documented experience and licensed in State of Kentucky.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Performance and Design Criteria:

1. Well & Well Pump:
 - a. Shall be capable of supplying both Winter and Summer design conditions.
 - b. Winter Design Flow Condition:
 - 1) Design Flow Rate: 2,000 gpm.
 - 2) Design Flow Total Dynamic Head at the discharge flange: 167.2 feet.
 - 3) Minimum Hydraulic Efficiency at Design Flow Rate: 82 percent.
 - c. Summer Design Flow Condition:
 - 1) Design Flow Rate: 800 gpm.
 - 2) Design Flow Total Dynamic Head: 84.5 feet.
 - d. Static Head: 75.5 feet.
 - e. Net Positive Suction Head Available: 30.5 feet includes 2-foot safety factor (to be confirmed).
 - f. Suitable for use with groundwater supply and outdoor installation.
 - g. Pressure ratings of pumps, pipe fittings, valves, gauges, and all other water carrying appurtenances shall be suitable for the anticipated system pressures in which they are installed.
 - 1) System pressure rating = 150 PSIG.
 - 2) Maximum design operating pressure = 100 PSIG.

2.2 WELL PUMPS

A. Acceptable Manufacturers:

1. Flowserve (basis of design),
2. Peerless Pump,
3. or approved equal.

B. Description:

1. Type: Above-ground discharge & motor, close-coupled, multi-stage vertical turbine.
2. Lubrication: Product lubricated.
3. Shaft: Vertical.
4. Suitable for insertion into well casing.
5. Coating:
 - a. Paint external surfaces with factory standard enamel coating. Color: blue.
 - b. Interior of bowl assembly: Shall be "3M Scotchkote" fusion-bonded epoxy or approved equal.

C. Construction:

1. Discharge Head:
 - a. Material: Cast iron ASTM A48, Class 30.
 - b. Flange Rating: 125-pound.
 - c. Packed stuffing box rated for discharge pressure with bronze bearing.
2. Column:
 - a. Material: ASTM A53, Grade B steel pipe.
 - b. Section lengths shall not exceed 10 feet.
 - c. Threaded sleeve type couplings.
3. Line Shaft:
 - a. Open Type.

- b. Material: 416 Stainless Steel.
 - c. Stainless steel threaded couplings.
 - d. Include bearing retainer type and material: Drop-in, Buna-N rubber.
 - e. Shall be straight to within 0.005 inches for a 10-foot section.
4. Bowl Assembly:
- a. Material: Cast iron.
 - b. Bearing materials: Bronze C84400.
 - c. Bowl shaft: 416 stainless steel.
 - d. Impeller: Bronze CDA872.
 - e. Suction strainer: stainless steel.

D. Operation:

- 1. Electrical Characteristics:
 - a. As specified in Division 26.
 - b. Voltage: 480 V, three phase, 60 Hz.
- 2. Motors:
 - a. Premium efficiency, 1.15 service-factor.
 - b. 125-hp non-overloading.
 - c. Speed: 1,200 rpm nominal.
 - d. NEMA design "B".
 - e. VFD compatible.
 - f. Enclosure type: WP-2 minimum.
 - g. Vertical, hollow shaft type.
 - h. Motor shall have static thermistor type high temperature protection embedded in each winding. This shall cause the motor to shut-down and an alarm issued by the PLC upon high temperatures.
 - i. Equipped with a heater & dehumidifier to protect bearings from freezing and moisture.
- 3. Pump Controller:
 - a. See Division 33 "Pump Controls – Gray Lane Pump Station".

2.3 WELL CASINGS

A. Description:

- 1. Material:
 - a. Standard Schedule, minimum wall thickness 3/8-inch.
 - b. Comply with ASTM A53/A53M, Grade B.
 - c. New material only.
- 2. Nominal Diameter: See Drawings.
- 3. Accessories: Top mounting flange.

2.4 WELL SCREENS

A. Description:

- 1. Configuration: Continuous slot; wire wound.

2. Circumferentially wrap trapezoidal shaped wire around circular array of equally spaced rods or perforated channels.
3. Wire configuration to produce inlet slots with sharp outer edges, with the opening widening inwardly to minimize clogging.
4. Material: Type 304 stainless steel.
5. Telescope diameter size.
6. Slot opening of 0.125-inch with a Collapse Strength of 32-psi (minimum).
7. Design of 0.1 ft/sec entrance velocity.
8. Screen area depth: 18 feet (estimated). Does not include blank screen inside the well casing.
9. Tensile strength: The minimum screen tensile strength must exceed at least twice the total weight of the screen and any standard wall blank casing suspended below the top screen joint.
10. Manufacturer: Johnson Screen Model Hi-Flow Screen "T" Type or approved equal.

2.5 MATERIALS

A. Filter Packs (if required, see Drawings):

1. Description: Clean, well rounded, smooth, and uniform; mostly grains.
2. Material:
 - a. Siliceous.
 - b. Calcareous Material: Not more than 5 percent by weight.
 - c. Minimum Specific Gravity: 2.5.
3. Grading:
 - a. Determination: From sieve analyses of aquifer materials.
 - b. Passing Size: Four to six times thirty-percent passing size of aquifer sample having finest grain-size distribution.
4. Minimum Uniformity Coefficient: 2.5.

B. Grout:

1. Type:
 - a. Portland cement.
 - b. Comply with ASTM C150/C150M, Type 1.
2. Mixture: Not more than 5 gal. of water per 94-lb. bag of cement.
3. Obtain approval of Engineer to use bentonite or other additives, up to 6 percent by weight of cement, to reduce shrinkage permeability, increase fluidity, or control setting time.

2.6 ACCESSORIES

A. Well plate:

1. Steel plate to transition from well casing flange to pump mounting base. Plate shall be designed and supplied by pump supplier and coordinated with the casing pipe supplier.
 - a. Furnish materials according to AWWA A100 standards.

B. Sensor Casing pipe:

1. Schedule 40 PVC per ASTM Standards.

C. Securing Straps:

1. For securing sensor casing pipe to inside wall of casing pipe. Equipped with adjustable screw.
2. Material: Stainless Steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution.

B. Verify that Site conditions are capable of supporting equipment for performing drilling operations.

C. Well Drawdown Test:

1. General:

- a. Contractor shall perform a well drawdown test of the existing groundwater well prior to finalizing product submittals and ordering materials. Scope of the test includes:

- 1) Remove the existing pump,
- 2) Assessment the existing well (see requirements below),
- 3) Well Drawdown Test,
- 4) Review of results with hydrogeologist, Owner, and Engineer, and
- 5) Re-install the existing pump.

- b. Removal and re-installation of the well pump shall be by a well installer certified in the Commonwealth of Kentucky.

- c. Drawdown Test shall be performed, overseen, and a final report developed by a hydrogeologist registered in the Commonwealth of Kentucky.

- d. Information regarding the construction and known character of the existing well and aquifer are provided as Supplements at the end of this Section.

- 1) Existing well is a 14-inch diameter steel casing.

2. Procedures:

- a. The goal of the drawdown test is to ascertain the hydraulic characteristics existing well and aquifer, mainly the well water level at the seasonal design conditions.

- b. The drawdown test shall consist of two Constant Rate Pumping Tests, one at each of the design flow rates. Test shall be single well type with no observation wells. Daily water withdrawal from the well shall not exceed those stated in the Owner's water withdrawal permit.

- c. The test procedures shall comply with ASTM D5789, D6034 and other applicable ASTM and AWWA standards for testing fully developed water supply wells.

- d. While the existing pump is removed from the well an assessment of the existing well shall be performed (see below).

- e. Test discharge water shall be pumped to the Pirtle Spring Water Treatment for treatment. This will require the test equipment to be disinfected per Owner's standards and make temporary connection to the existing raw water transmission pipeline at the site. Reference the Drawings for existing piping layout.
- f. Test performer shall supply (at a minimum) the following equipment: generator, pump, submersible transducer for constant measurement well level, pressure gauge, throttling valve, electronic flow meter, data loggers, piping and fittings to connect to existing raw water transmission main, and any other equipment necessary for complete drawdown test.
- g. Field results shall be submitted to the Owner and Engineer as an information submittal immediately following each stage of the test. A report prepared by the hydrogeologist to be submitted within two weeks of the completion of all tests and assessments. The report shall estimate the water level for both design conditions while accounting for the date, season, and weather conditions of the actual field test.

D. Existing Well Assessment:

- 1. Contractor shall perform an assessment of the existing well. Assessment shall be overseen, and a final report developed by a hydrogeologist registered in the Commonwealth of Kentucky.
- 2. Assessment shall include obtaining all feasible information for the following characteristics from inside the well and other non-destructive methods recommended by the hydrogeologist (including: ground penetrating radar, document research of the existing well and other wells in the region, and/or electrical resistivity):
 - a. Casing Pipe: Diameter, wall thickness, depth.
 - b. Intake Screen: Diameter (inside and outside), material, height of blank screen, height of screened area, wire configuration, slot size.
 - c. Filter pack (if present): Confirm if one is present, material, gradation, and thickness.
 - 1) If filter pack characteristics cannot be assessed while the pump is temporarily removed, then filter pack shall be assessed by the Contractor and hydrogeologist when the existing casing and screen are removed prior to installation of the new screen.
 - d. Depth of aquifer at the well site: Upper and lower depths.
- 3. Raw field data shall be submitted to the Owner and Engineer as an information submittal immediately following completion of the assessment. See Well Drawdown Test for requirements on a final report.

3.2 PREPARATION

- A. Section 01 73 00 – Execution.
- B. Protect structures near well from damage.

3.3 INSTALLATION

- A. Drilling:

1. Drilling Equipment: To be determined by CONTRACTOR.
 2. Drill concentric well shaft to diameters and depths as indicated on Drawings.
 3. Remove loose material from shaft bottom.
 4. Allow inspection of casing prior to placement of grout.
 5. Shaft Top:
 - a. Cut off shaft top as shown on drawings.
 - b. Prevent metal cuttings from entering casing.
 6. Record accurate log of materials penetrated to determine depths and thicknesses of underlying formations.
 7. Prepare electric log recording resistivity, spontaneous potential, and gamma for total depth of borehole.
 8. Record caliper, temperature, fluid conductivity, and optical or acoustic televiewer logs to total depth of borehole.
 9. Casing and Screen:
 - a. Place well casing and screen assembly immediately after drilling.
 - b. Keep casing and screen under tension during filter packing.
 10. Install filter packing.
 11. Test borehole for plumbness according to AWWA A100.
 12. Place grout tight to surrounding Work according to AWWA and ACI standards.
 13. Maintain well opening and casing free of contaminating materials.
- B. Disinfection: Disinfect well according to Division 33 “DISINFECTION OF POTABLE WATER PIPE”.
- C. Installation Standards: Install Work according to AWWA A100 and Kentucky DOW standards.

3.4 TOLERANCES

- A. Section 01 45 00 - Quality Control.
- B. Maximum Variation from Plumb: According to AWWA A100
- C. Maximum Offset from Indicated Position: 1 inch.

3.5 FIELD QUALITY CONTROL

- A. Section 01 73 00 – Execution.
- B. Performance Testing:
 1. Hydraulic Institute 14.6 Unilateral (1U).
 2. Notify Engineer at least three days prior to flow rate testing.
 3. Test flow rate and well level and certify. Test shall be for both Winter and Summer design conditions listed herein.
- C. Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.

3.6 SUPPLEMENTS

January 2022

33 11 00 - 9

00904-0010
Groundwater Sources

A. The supplements listed below, following “End of Section”, are part of this Specification:

1. Kentucky Groundwater Data Repository Report; printed July 12, 2021.
2. Kentucky Well Inspection Form; dated September 22, 1999.
3. Pump Installation Report; dated March 6, 1992.
4. Water Withdrawal Permit, Summary Letter; dated August 17, 2015.
5. Wellhead Protection Plan Update (5-year update form only); dated 2021.

END OF SECTION 33 11 00



Detailed Info About This Well (Casing & Lithologic)

Kentucky Groundwater Data Repository

AKGWA #: **00052628**PWSID (public well ID): **0470393**AI Number #: **1673**Quadrangle: **Howe Valley**County: **Hardin**Latitude, Longitude (dms): **37° 43' 5.988", -86° 4' 44.004"**Latitude, Longitude (dec degree): **37.71833, -86.07889**Regulatory Program: **Water Withdrawal**Surface Elev (ft): **705**Total Depth (ft): **78**Depth To Bedrock (ft): **0**Static Water Level (ft): **62**Status: **Active**Primary Use: **Public - Community**Owner Information: **Hardin County Water District 1****1400 Rogersville****Radcliff, KY 40160****(270) 862-4340**

Scanned Document (pdf):


[Documents](#)

DOWNLOAD THIS REPORT INTO A SEMICOLON-DELIMITED TEXT FILE

Lithology report, casing report, and water quality data availability:

****No Water Well Lithology Report For This Well****

Water Well Casing Report

Casing Start Date	From (ft)	To (ft)	Interval (ft)	Hole Inside Diameter (in)	Casing Inside Diameter (in)	Casing Type	Screen Slot Size
1/1/1992	0	0	0	0	14	Steel	

****No Water Quality Data For This Well****

Print

Close Window

KENTUCKY WELL INSPECTION FORM

2

(1) AKGWA NUMBER 0 0 0 5 - 2 6 2 8

Attach Well Record



0005-2828

Note: Water well labels begin with "0", monitoring well labels begin with "8".

(2) OWNER/FACILITY INFORMATION
 Well Owner's Name: *Hardin County Water District #1*
Last First MI
 Mailing Address: *1400 Rogersville*
 City: *Cecilia* State: *KY* Zip: *42724*
 Well Address (if different): *Gray Lane*
 City: *Cecilia* State: *KY* Zip: *42724*
 Phone: *(270) 862-4340*

(3) WELL RECORD LABEL LOCATION:
 well casing pressure tank water pipe
 well cap electric box not labeled
 pump other

(4) USGS Quadrangle Name: *Howe Valley* County: *Hardin*
 WELL LOCATION Latitude: *N 37° 43' 08.2"* Longitude: *W 86° 04' 45.4"*

(5) PHYSIOGRAPHIC OR HYDROLOGIC REGION
 Blue Grass Ohio River Alluvium
 E. Coal Field W. Coal Field
 Miss. Plateau Jackson Purchase

(6) DRILLER INFORMATION
 Who Constructed Well? *LAYNE WESTERN* unknown
 Address: _____
 City: _____ State: _____ Zip: _____
 Date Well Completed: _____
Month Day Year

(13) WELL USE (check all that apply)
 domestic livestock not used
 public irrigation abandoned
 industrial monitoring
 other
 PWSID# *0470393*
 Water Withdrawal Permit # *1162*

(18) ELEVATION
705 ft. AMSL
 From ground surface
 top of casing
 By map
 survey
 report
 GPS

(7) GENERAL
 Type of Construction:
 drilled/augered
 excavate & backfill
 hand dug/blasted
 Depth of Well: *78* ft.
 measured
 reported
 unknown
 Static Water Level, ft. below surface: *62'*
 measured
 reported
 not measured
 can't be measured
 Well Yield: *650*
 gpm gph gpd
 measured
 estimated
 unknown

(9) WELLHEAD
 Is Well Located in a Pit?
 yes no unknown
 Wellhead (casing top):
 well cap sanitary seal
 flush mount locking cap
 open unknown
 Casing Above Ground Level?
 yes no unknown
36 inches above ground.
 Discharge Pipe Below Surface?
 yes no unknown
 Pitless Adapter Used?
 yes no unknown

(14) WELL SERVICE
 Number of People Served: *27000 + sold to*
 Number of Service Connections: *9000*
 Any Quantity Problems? yes no
 Any Quality Problems? yes no
 If "yes", describe in COMMENTS section, below.

(19) TREATMENT SYSTEM
 none
 water softener
 ultraviolet
 chlorination
 aeration
 charcoal filter
 sand filter
 iron treatment
 fluoridation
 other
 Treatment Bypass Available? yes no

(8) SURFACE ANNULAR MATERIAL:
 clay drill cuttings
 cement unknown
 open sand gravel
 concrete pad

(10) PUMP DETAILS
 Date Installed: *3 6 92*
Month Day Year
 Pump Type: *Layne Western*
 submersible bailer
 turbine jet hand pump
 none other unknown
 Intake Level: *72' 9"* ft. below surface
 Electric Connection:
 2 wire 3 wire unknown

(15) COMPLIANCE TO STANDARDS
 Construction in Compliance with KY Standards?
 yes no unknown pre-law
 If "no", describe in COMMENTS section, below.

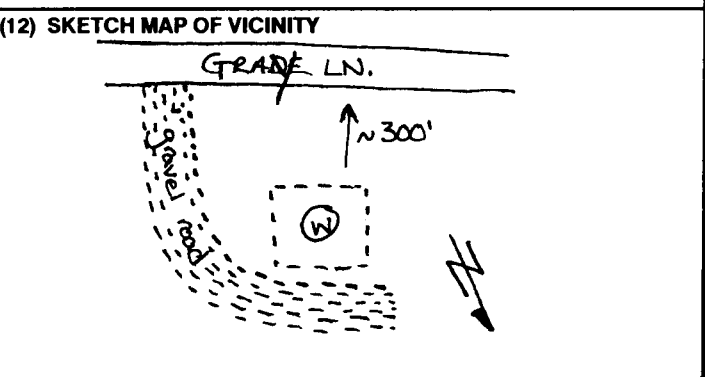
(16) RELATIVE LOCATION
 upgradient sidegradient unknown
 downgradient varying N/A

(11) WELL CONSTRUCTION DETAILS

Feet Below Surface From	To	Casing Inside Dia. (in.)	Casing Type	Casing Wall Thickness (in.)
		<i>14"</i>	<i>steel</i>	

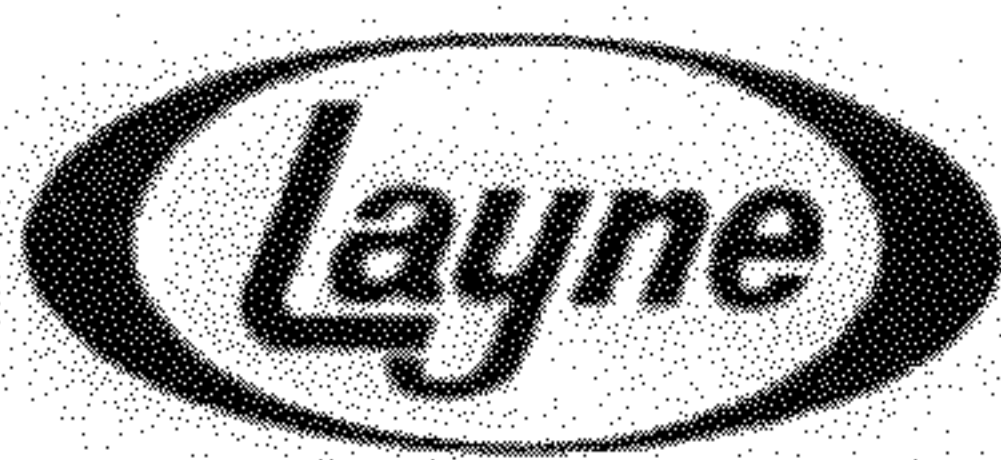
(17) INSPECTION INFORMATION
 Date of Inspection: *9 22 99*
Month Day Year
 Water Quality Sample Taken: yes no
 Reason for Inspection:
 general survey
 specific complaint investigation
 spill or incident response
 contamination site investigation
 enforcement
 general water quality analysis
 ambient groundwater monitoring
 other *WHPP*
 Program Name and Facility ID#:

(20) OPTIONAL USE
 Will Owner Allow State Access?
 yes no unknown
 Extent of Monitoring Allowed:
 collect sample
 measure SWL
 pump well
 complete access
 notification required
 other (describe below)
 Monitoring Feasibility:



(21) COMMENTS:
14) Turbidity spikes in storm events
14) sells to Merks, Vine Grove, Rodoliff

(22) INSPECTOR IDENTIFICATION
 Name: *E. ELLISON*
Last First MI Inspector ID#
 Agency: DOW DWM CHR KGS other
 Signature of Inspector: _____ Date: *9/22/99*



Layne-Western Company, Inc.

19

LOUISVILLE • OWENSBORO

PUMP INSTALLATION REPORT

File No. _____
 Sales Order No. 52-4089 Date 3-6-92
 Pump Mfg. LAYNE & BOWLER Serial No. 114068-11BH Well No. _____
 Owner HARDIN COUNTY WATER DISTRICT #1 City PIRTLE SPRINGS State KY
 Location of Well GRAY LANE SITE

MOTOR: Make US Type AV=DP Frame 286 TPH Ser. No. F405AV10U203R040F
 HP 30 Volts 230/460 Line Voltage 460 Phase 3 RPM 1760

Was Motor taken to a repair shop at this time? New Where? _____

GEAR DRIVE: Make Motor Borings Serial No. _____ Gear Ratio _____

ENGINE: Make Upper 73108T Model _____ Serial No. _____
Lower 6210-2ZJ/CB

PUMP HEAD Type Layne TF818

Discharge Pipe Size 8"

Located 3'6" above below ground

Flanged X Threaded _____

Separate Base Plate? yes

Head Shaft Length 5'2"

Dia. 1 3/16 Coupled above below XX

MOTOR SHAFT: Dia. 1 3/16 Length 30 3/4

Thread Size in Head 1 3/16 Keyway 1/4

PUMP BOWL Type Layne

Dia. 8 No. of Stages 2

Bowls - Cast Iron or Bronze? CI

Shaft - SS X CS _____ Length _____

COLUMN Pipe Size 8"

Flanged _____ Coupled X

Special Paint? NA

Oil Lube _____ Water Lube X

Shaft Size 1 3/16 SS X or CS _____

Tubing Size _____ Stl _____ or Br _____

SUCTION PIPE Size NA

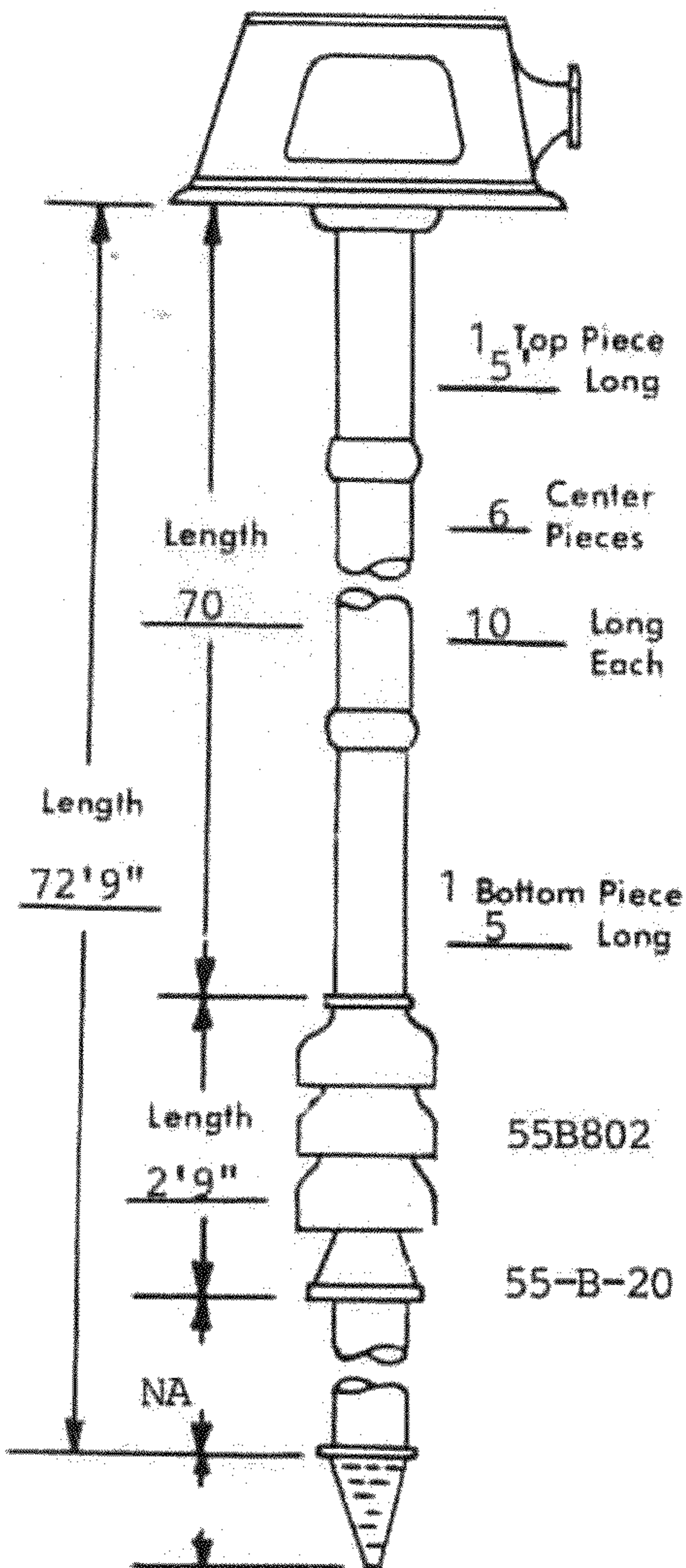
Length _____ Special Paint? _____

Threads on Bottom? _____

Strainer _____ Size _____

Rubber Bumper? _____

Well Seal? _____



NOTE - All measurements from top of pump foundation.

WELL INFORMATION: Inside Dia. 14" Depth 78 Static 62 Type: Gravel Wall Tubular

Air Line Length 70 Strapped to Column? taped

Type Airline copper Plastic _____ Copper Tubing _____ Steel Pipe _____

PUMPING TEST - Pumped 650 GPM at 62 Ft. Pumping Level _____

with 32 lbs. discharge pressure after 4 hours.

Pump to Waste Outside X Inside _____ Size _____ THD.O. _____

PULLING INSTRUCTIONS

Length of Poles required _____ Special equipment or pulling instructions _____

Power Lines: _____

REMARKS: _____



STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

August 17, 2015

Amanda Spalding
Hardin Co Water District 1
1500 Shipley Road
Cecilia, KY 42724

Water Withdrawal Permit: #1162
Activity ID Number: APE20150001

Dear Ms Spalding:

Thank you for your application for a revised water withdrawal permit. This letter accompanies permit #1162 which authorizes withdrawals from a well located immediately north of the Head of Rough River Overflow Spring located in Hardin County with geographic coordinates of latitude 37° 43' 6.67"N, longitude 86° 4' 53.57"W.

In accordance with this permit, water withdrawals are limited to the following rates from the specified location:


Jan. ≤2.880 MGD (MA)	April ≤2.880 MGD (MA)	July ≤1.152 MGD (MA)	Oct. ≤1.152 MGD (MA)
Feb. ≤2.880 MGD (MA)	May ≤1.152 MGD (MA)	Aug. ≤1.152 MGD (MA)	Nov. ≤1.152 MGD (MA)
March ≤2.880 MGD (MA)	June ≤1.152 MGD (MA)	Sept. ≤1.152 MGD (MA)	Dec. ≤2.880 MGD (MA)

Please refer to the enclosed permit which specifies all conditions associated with this withdrawal, including monitoring and compliance requirements.

The issuance of this permit does not release you from the obligation of obtaining any and all other permits that may be required by this Division or other regulatory agencies.

If you have any questions, please contact Chris Yeary or Rita Hockensmith at (502) 564-3410.

Issued this 17th of August 2015

By: 
John S. Webb, Manager
Watershed Management Branch
Division of Water

JSW: cz
Enclosure
cc: Louisville Regional Office

Hardin County Water District No. 1 (PWS ID 0470393)

Wellhead Protection Plan Update 2021





**ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION**

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601

**KENTUCKY DIVISION OF WATER
WELLHEAD PROTECTION PLAN
5-YEAR UPDATE FORM**

Update Requirements:

This form should be used for the 5-year update submittal requirements of the Kentucky Wellhead Protection Program (WHPP) in compliance with 401 KAR 4:220 and SDWA Section 1428. Once the form is complete, please sign and send to:

Kentucky Division of Water
Watershed Management Branch
Attention: Allan Shingleton
300 Sower Boulevard, 3rd Floor
Frankfort, Kentucky 40601 or allan.shingleton@ky.gov

For assistance contact Allan Shingleton at (502) 782-6907 or allan.shingleton@ky.gov

System Information:

PWS Name: **Hardin County Water District No. 1**

PWS ID Number: **KY0470393**

AI Number: **1673**

Contact Person/Title: **Stephen Hogan**

Mailing Address: **1400 Rogersville Rd.**

Telephone: **270-351-3222** Email: **shogan@HCWD.com**

System Type*: **Community**

*Community; Non-Transient/Non-Community; Transient/Non-Community

Source*: **2 Ground water under direct influence of surface water sources (3 wells total)**

*Well(s) or Spring(s) and total number of each

County: **Hardin**

ADD: **Lincoln Trail**

WWD Permit #: **1162; 0924** Permitted Amount (mgd): **2.88 Dec-Apr, 1.152 May-Nov ; 3.1 Jan-Dec**

Population Served: **27,033 R and 33,240 W**

Overall Susceptibility Rating*: **High** *High, Medium or Low

WHPP Changes Summary: **Not many changes other than the Planning team members. Management strategy updated with new sources to purchase water from neighboring utilities.**

Update Form Instructions:

Please complete each section that applies to any system or WHPP updates and submit the supporting documentation. Please indicate if a section is not applicable to this update. **Sections 4, and 6 through 11 are required for every 5-year update.**

Please sign certification on the last page upon completion.

Section Updates:

Section 1: Treatment Plant

If the treatment plant location has changed then provide a new location map below. This can be a county road map or a GIS-produced map. Please use the area below to provide relevant details, or to indicate that no change has occurred.

There has been no change in the location of the Pirtle Spring Water Treatment Plant.

Section 2: Water Withdrawal and Water Quality

If there have been changes in water withdrawal rates or water quality since the last submittal, provide a discussion of the relevant details in the space below (include new Water Withdrawal Permit Number if applicable). Include supporting documentation as an attachment.

Hardin County Water District No. 1 withdraws raw water from two sources. The primary source is Pirtle Spring which has maintained an approved 2.88 mgd (or higher) withdrawal rate since the 1980s. In 2017, the District was granted an increase to 3.1 mgd water withdraw under the stipulation that the flows from Pirtle Spring are above 1.0 cubic feet per second. In 2019, the District and Kentucky Geological Survey (KGS) installed a pressure transducer in the Pirtle Spring, downstream from the wells. This transducer is converted to feet and is trending on our SCADA computer in the water treatment plant. KGS is continually taking discharges of both Pirtle Spring and Gray Lane (Head of Rough) to better correlate the transducer display and flows downstream. The secondary source is Gray Lane. Gray Lane's permitted withdrawal rate has changed three times since the last WHPP submittal. The original withdrawal permit was seasonal, allowing 0.72 mgd withdrawal during the higher demand spring and summer months – April thru September, and 0.12 mgd for the lower demand fall and winter months – October thru March. In 2013, the District submitted a request to extend the 0.72 mgd withdrawal to year-

round and it was granted. In 2014, the District requested that the withdrawal rate be increased to 1.152 mgd in order to maximize the energy efficiency of the pump located at Gray Lane. This request was granted as well. In 2015, the District requested that the withdrawal rate be increased to 2.88 mgd in order to achieve redundancy with Pirtle Spring. The District was granted this request for Dec – April (wet season), but was told that there was not sufficient evidence to grant this request for the dry season. The May – Nov maximum withdrawal rate remains at 1.152 mgd.

Pirtle Spring and Head of Rough receive water from separate watersheds. Pirtle Spring collects water from a 27-square mile area and Head of Rough receives water from a 17-square mile area. These areas, which cover mostly agricultural land, receive rainwater and flow it through karst aquifers. Water quality in karst aquifers can be highly variable at times. In karst terrains characterized by an abundance of sink holes and sinking streams, as the Pirtle and Head of Rough basins are, rainfall events can result in an abundance of water entering and passing through the aquifer in a short amount of time. This can result in large variations in the amount of flow passing through at any given time. The heavy runoff of such storms can also result in heavy loads of sediment being flushed through the aquifer at the same time. Such events can also affect the passage of contaminants through the aquifer.

The District withdrawals water from wells drilled into conduits near the springs for each aquifer. Water quality is monitored daily by WTP operators. Raw water is tested for turbidity, fluoride, temperature, pH, hardness, alkalinity, iron, TOC, and ammonia.

Section 3: Change or Modification to Groundwater Source

If the system has changed or modified the wells or springs being used, provide the following: 1) a description of changes/modifications; 2) copies of the relevant form(s) (Kentucky Water Well Record, Well Maintenance & Plugging Record, Well Inspection Form or Spring Inventory Record); and 3) any other information relating to well construction (i.e., installation logs, driller's logs, lithologic or geophysical logs), below.

There have been no changes or modifications made to the wells or springs being used.

Section 4 (REQUIRED): Planning Team

Effective water supply protection requires community involvement and public awareness. Identify the planning team consisting of a leader and at least two team members, with their respective titles, below.

Leader:

Chris Gohman- Pirtle Spring Water Treatment Plant, Hardin County Water District No.1

Team Members:

Adam C King- Director of Planning and Development Commission

Rob Blair- KY Division of Water, Watershed Management Branch

Chuck Taylor- KY Geological Survey

Stephen Hogan- General Manager, Hardin County Water District No.1

Justin Metz- County Systems Manager, Hardin County Water District No.1

Daniel Linder- Water Quality Specialist, Hardin County Water District No.1

William Gossett- HCWD 1 Board Member and Watershed Land-owner

Steve Webb, Kentucky Geological Survey- lead geologist on the SWPAP grant

Section 5: WHPA Delineation

If the system is revising a Wellhead Protection Area (WHPA) delineation, or if a new groundwater source has been added since the last submittal, provide a site-specific description of the local geology and aquifer. Include references for published literature. Provide a summary of any aquifer tests (i.e. pumping tests, slug tests, tracer tests), including data gathering and evaluation methods. Show calculations and supporting data for each WHPA delineated or revised. Include the detailed hydrogeologic report as an attachment.

There have been no changes made to the delineation of the WHPAs. Please see attached figure.

Section 6 (REQUIRED): WHPA Map

Provide a WHPA map that shows each groundwater source labeled with the appropriate AKGWA #, all protection zones identified and the Contaminant Source Inventory (CSI) point locations. If no changes have occurred since the last submittal, then a copy of the most recent WHPA/CSI map can be resubmitted. Please contact program staff for assistance.

The attached map shows the WHPAs for Pirtle Spring and Gray Lane.

Section 7 (REQUIRED): Contaminant Source Inventory

Provide an updated CSI in table format. This can be created using the spreadsheet template provided, and copied into the space below. If no changes occurred since the last update, the table can be pulled from previous WHPP documents. Each contaminant source listed should have a Contaminant Source ID # that corresponds to the WHPA map in Section 6. The CSI table must show the susceptibility determination ranking for each contaminant source. Include a brief discussion of the overall system susceptibility. Please contact program staff for assistance.

No significant changes other than 1 site has been removed due to Howe Valley Elementary School no longer exists. Attached is the updated table.

Section 8 (REQUIRED): Management Strategies

Provide a discussion of the previous and newly proposed management strategies. This discussion

must include the previous management strategies that were implemented as well as the goals that were met. Next, include any NEWLY proposed management strategies, associated goals, implementation plans and the party responsible for implementation.

Previous Management Strategy Update:

The purpose behind managing a wellhead protection area is to minimize the impact of land uses that threaten the quality and quantity of the public's drinking water supply. The underlying theme is simply to prevent pollution. Preventing pollution is the key to keeping groundwater supplies safe and to protect public health.

Pirtle Spring Water Treatment Plant and its two sources of supply are located in rural central Kentucky. The watersheds are made up of networks of ponds, sinkholes, sinking streams, etc. comprising an amazing network of channels that transport water through the karst aquifers. The prominent land use in the watersheds for both Pirtle Spring and Head of Rough is agricultural. The watershed includes residences equipped with their own septic systems and residential propane tanks. The USGS reports that the State has a record of 38 springs and 700 wells listed in the DW Data Repository for the area comprising these two watersheds. There are countless access points to these groundwater channels. Because of all of these access points and potential pollutants, the watersheds have been classified as hydrologically sensitive, with high susceptibility to contamination.

Preventing and controlling pollution is a critical part of protecting the District's source water. Beginning in 2004, numerous samples in and around the Rough River Lake Reservoir showed levels of atrazine that exceeded the EPA's safe water criteria. The Ag Agent in Breckinridge, Hardin, and Grayson Counties became significantly involved in identifying and eliminating the sources of contamination. The following actions include some, but not all measures taken to remedy the situation:

- Developed a water testing task force including the Army Corps of Engineers, four water plant managers (including Hardin County Water District No. 1), the KY Department of Agriculture and Western KY University.
- Identified problem areas as areas of corn production in all three counties. (Atrazine is commonly used for no-till corn farming.)
- Held numerous meetings within communities to discuss the atrazine situation
- Hosted field days to educate farmers regarding Best Management Practices (BMPs) including vegetative buffers around fields, streams, and sinkholes; proper quantity and area of application for atrazine; fencing off sinkholes and filling them with rock; etc.
- Publicized measures taken and noted success of the project as atrazine levels significantly declined.

In 2012, the District was awarded a small settlement as 1 of 1,085 systems that were a part of a class action lawsuit against Syngenta Crop Protection, Inc. in regards to atrazine. These water systems showed that they have been negatively impacted by the use of atrazine, used to control weeds on corn, sorghum, sugar cane, and other specialty crops. A 2012 review of the Statewide GW Monitoring Network scans showed detections of atrazine in 34 of 49 raw sampling events at Pirtle Spring. The District has been working with these watershed communities to raise awareness of the positive impact that environmentally sound practices can have on the region as a whole, extending well beyond property lines.

The Hardin County UK Cooperative Extension Service (Douglas Shepherd, County Extension Agent – 270-765-4121) assists with pollution prevention in other ways also.

- They continue their Pesticide Certification Training, which is a two hour course that is renewed every 3 years.
- They assist with Agriculture State Water Plans that are required for all farms with 10 or more acres.
- The Cooperative Extension Service has also been involved in a Rinse and Return Pesticide Containers program, a joint program between the KY Dept. of Agriculture and Hardin County Fiscal Court.

In June 2012, Pirtle Spring WTP was hit with raw water containing high levels of ammonia, fertilizer used in surrounding farmland. This event eventually led to a system-wide BWA as chlorine levels throughout the distribution system fell below minimum requirements. The District has since implemented raw water ammonia testing at Pirtle Spring WTP and operators are well-informed that hits of ammonia warrant increased chlorine dosages.

Beyond the scope of agricultural influences, Hardin County Water District No. 1 understands firsthand how contamination in the source watershed affects operations. In 1999, the District experienced a major contamination event that shut down Pirtle Spring Water Treatment Plant for 65 days. A ruptured valve on a furnace fuel tank at a local elementary school had leaked about 450 gallons (1703 liters) of heating oil into the local ground water table. WTP operators shut down the WTP, but the contamination had already hit the distribution system. Luckily, management had had the foresight to design and build an interconnect with Ft. Knox Water. The Ft. Knox Interconnect allowed District customers to maintain water supply during this critical time.

In 2016, The District was awarded a \$50,000 grant from the KDOW Wellhead Protection Program: Source Water Protection Assistance. The District worked with KY Geological Survey (KGS) to obtain funding for flow and water quality monitoring for Head of Rough. By studying the flow and water quality characteristics over an extended period of time, the District along with KGS can obtain information on potential increases in water withdraw and the characteristics of the spring. The original project was completed in 2018. However, the District and KGS have continued a relationship to work together to monitor both springs, in particular spring levels and flow correlation. The completed Program description from the District and the summary from KGS is attached.

District management has since signed an interconnect agreement with Louisville Water Company. In 2018, this came to fruition with an interconnect with the Louisville Water Company in the city of West Point. The District is able to purchase up to 3 mgd. The District also has interconnects with Hardin County Water District No. 2 and Hardinsburg Water. In the fall of 2020, the district completed a new interconnect with Hardin County Water District No.2 that is able to supply the District more than 3 mgd. This interconnect is located off Patriot Parkway Highway. The redundancy of supplemental sources for the District is a huge positive. To combat potential contamination in source waters as well as to improve overall raw water quality, the District is seeking to have redundancy of sources. Because Pirtle Spring and Head of Rough are in completely separate watersheds, the potential is there. Currently the water withdrawal at Pirtle is 3.1 mgd and the water withdrawal at Head of Rough is 2.88 from Dec – Apr and 1.152 mgd from May - Nov.

Moving forward, the District has requested and has been allowed to add the Head of Rough Spring to the Groundwater Monitoring Network's list of monitored springs. Nearly every

quarter, personnel from the Watershed Management Branch sample these two sites, returning samples to their lab personnel who then perform thorough scans that include pesticides and herbicides. In recent years any detections of atrazine in the raw spring water have been at levels less than the MCL in finished water for that parameter. If this changes, Hardin County Water District No. 1 personnel will have the information in a timely fashion and can begin actively informing residents within these watersheds through their I-Call system. This I-Call system is a great resource as it can be utilized as a direct educational tool.

Finally, the District has met public education and awareness objectives. Road signs were placed on Hwy 86, St. John's Rd, and Hwy 920. Every year, the Consumer Confidence report explains Wellhead Protection. Facility tours with boy scout troops and elementary schools include public education with some very effective displays featuring karst aquifers, WHPAs of KY, and the District's WHPP. Career Day events at the local schools also allows the Hardin County Water District No.1 to educate the youth on the benefits of Wellhead Protection.

Newly Proposed Management Strategies:

With the addition of the LWC interconnect in West Point and the interconnect with Hardin County Water District No.2 off of Patriot Parkway Highway, the District has numerous back-ups in the event of an emergency with our source water. The District has also recently began self-operation of the Ft. Knox Water Treatment Plant (previously contracted out to LWC). With this, the District is completely renovating the Muldraugh WTP on Ft. Knox. It will become a possible 7.0 mgd WTP that is a Chloraminated system. This will allow the District if necessary to purchase water from them as well. The project is to be completed in the fall of 2021. Also, the District has put in an RD loan request that will upgrade our Gray Lane pump station. Currently the pump on site can only do about 1.15 mgd (our lowest withdraw amount). However, our permit can allow up to 2.88 mgd from Dec-Apr. Our current pump can not do this; with the help of the RD loan, Gray Lane will be able to pump the maxium amount during those month. There will also be a VFD installed there to help control the pumping and electric costs. This larger pump will help the WTP in the event the Pirtle Spring is contaminated to allow more treatment from the Gray Lane source. Due to Covid-19, the RD process has been slow moving forward so a time frame for completion is TBD.

Section 9 (REQUIRED): Contingency and WHP Planning

Provide a description of Contingency and WHP Planning. Complete the Emergency Response Phone List, Procedures for Public Notification, identification of Potential Future Problems and the procedures to establish Alternative Water Supplies. This section must also address how often the WHPP will be reviewed and updated.

Emergency Response Phone List

Fill in all Blanks and Phone Numbers with appropriate information.

Local Emergency Response	Phone Number
Plant Operator Chris Gohman	(270)-766-7700
KY 86 Fire Department	(270) 862-3327
Elizabethtown Police Department	(270) 765-4125
Hardin County Sheriff	(270) 765-5133
Local Emergency Dispatch Hardin County Emergency Management	(270) 765-5978 or 911

State and Federal Assistance	Phone Number
Kentucky DOW (Frankfort)	(502) 564-3410
Kentucky DOW Associated Field Office Louisville Regional Office	(502) 429-7122
Kentucky Environmental Response Team 24 hour response line	(502) 564-2380 (800) 928-2380
Kentucky State Fire Marshall	(502) 573-0382

Any Other Pertinent Contacts	Any Other Pertinent Numbers
Stephen Hogan	(502) 483-7224
Justin Metz	(502) 483-7215
Click here to enter text.	

Procedures for Public Notification:

In the event of a water system emergency that would threaten the health or life of the public, use the following procedure. Prepare and broadcast an advisory, including directions for the public. Describe the public notification process and provide contacts for those media outlets. If the system uses methods other than traditional media please list them.

In the event of a system emergency, the District will utilize our 1-call phone system and the local radio stations to announce the emergency. The local news paper, The News- Enterprise, will also be utilized but the emergency might not be posted until a day or 2 later. The 1-call system, which

will notify all affected customers as long as their account has an updated number, and the radio station are the quickest ways to reach our customers.

Newspaper, Television, and Radio Stations	Phone Numbers
The News-Enterprise	270-769-1200
98.3 Quicksie Radio Station	270-763-9830

Potential Future Problems:

Describe the *most likely* scenarios that could threaten the water supply.

Agriculture activities and contaminants are the biggest threats to the Pirtle Spring WTP supply of water. A spill or dump of a herbicide or pesticide in the protection area could have a major impact on the treatment. However, the District has planned very well in the case of issues at the treatment plant by multiple interconnects with numerous different utilities (Louisville Water Company, Hardin County Water District No.2, and Ft. Knox Water).

Alternative Water Supply (Short and Long Term):

Describe the short term and long term water supply alternatives that address each of the potential future problems identified above. List all current interconnections with other water systems. Discuss the capacity of each potential alternative water supply to sustain normal operations.

The District has many alternative water supplies due to the interconnects with the neighboring utilities. One interconnect with Louisville Water Company in West Point, KY. Two interconnects with Hardin County Water District No.2 (Patriot Parkway Highway and Longview-off of Wilson Rd.). One interconnect with Ft. Knox Water (Prichard Pump station). All of these are a big advantage for the District and our customers.

Schedule for Update and Review:

The Wellhead Protection Plan will be reviewed regularly and updated every five years as required by regulation.

Section 10 (REQUIRED): Copies of Public Notices and Education Materials

Provide copies of wellhead protection public notices and education materials distributed.

There is information on the Wellhead Protection placed annually in our CCR. The District participates in numerous career days and after school programs at the local schools. As part of the SWPAP grant, the District and Elizabethtown High School had multiple interactions that included PowerPoint presentations on water quality and source water protection at the school and then a facility tour of over 20 students at the WTP.

Section 11 (REQUIRED): Public Meeting Documentation***

Provide the record of WHPP public meeting attendance, minutes and comments.

There was no meeting due to COVID-19. A link to the WHPP update will be on the website.

***Non-Community Water Systems are not required to have public meetings for 5 year updates, but must post a public notice in a conspicuous place. A public notice template is provided as a separate document. However, public input and associated documentation are encouraged. Please contact program staff if you have any questions.

Certification Signature (TO BE COMPLETED BY PLANNING REPRESENTATIVE):

"I certify that this document and all attachments were prepared under my direction or supervision. The information submitted is, to the best of my knowledge and belief, true, accurate, and complete."

Signature: _____ **Date:** [Click here to enter text.](#)

Printed Name/Title: [Click here to enter text.](#)

Assistance:

For any assistance please contact Wellhead Protection Staff:

Rob Blair
(502) 782-6893
Robert.Blair@ky.gov

Allan Shingleton
(502) 782-6907
Allan.Shingleton@ky.gov

Benjamin Currens
(502)782-5227
Benjamin.Currens@ky.gov

Please sign and return completed form to:

Kentucky Division of Water
Watershed Management Branch
Attention: Allan Shingleton
300 Sower Boulevard, 3rd Floor
Frankfort, Kentucky 40601
or allan.shingleton@ky.gov

Gray Lane
Intake Well

Gray Ln





**Pirtle Spring Water
Treatment Plant**

Pirtle Spring

SECTION 33 13 00
DISINFECTION OF POTABLE WATER PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor and material necessary to disinfect and flush the newly installed or repaired potable water mains as shown on the Drawings and specified herein. Included are materials for temporary blowoff and sampling taps. Only HCWD1 personnel shall operate active hydrants and valves. For contracts with HCWD1, there will be no charge for water or labor.

1.02 RELATED WORK

- A. Division 31 "Excavating, Backfilling and Compacting for Utilities"
- B. Division 33 "Water Pipe and Fittings"
- C. Division 33 "Water Valves and Gates"

1.03 REFERENCES

- A. AWWA C651-14 Disinfecting Water Mains.

1.04 RELATED DOCUMENTS

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DISINFECTION AND FLUSHING OF WATER LINES

- A. Sterilization of pipe line shall be in accordance with the American Water Works Association Specification C651-14 using granular HTH. The pipe line shall be disinfected by using a 50 mg/l chlorine solution for a contact period of 24 hours. Not before the end of the 24 hour retention period, the residual will be tested and the concentration shall be at least 25 ppm. Pipes shall be thoroughly flushed upon meeting the chlorine residual requirements.
- B. Before the main is chlorinated, it shall be filled to eliminate air pockets and flushed to remove particulates.

- C. Preliminary and final flushing velocity in the main shall not be less than 2.5 ft/sec unless waived by HCWD1. The required flow and opening size to flush pipelines at 40 psi residual pressure is provided below.

<u>Pipe Dia (in)</u>	<u>Size of Tap/Hydrant Outlet (in)</u>
4	1
6	1.5
8	2
10	2
12	2.5 (two)
16	2.5 (two)

- D. The environment to which the chlorinated water is to be discharged shall be inspected. All flushing of high chlorinated mains need to be dechlorinated prior to discharging.
- E. Before the pipes are placed in service, samples of the water must be taken by the Contractor and submitted to a state-certified laboratory for testing. No pipes shall be placed in service until the samples have been approved by the agency. The Contractor shall obtain prior approval lab services from HCWD1 and bear all the cost of sampling, testing and postage.
- F. Sampling locations shall be approved by HCWD1.
- G. A satisfactory report for the section(s) under test must be submitted to HCWD1 and the Engineer before authorizing domestic consumption of the water.
- H. Sterilization procedures shall be continued until approved samples have been obtained.

END OF SECTION 33 13 00

SECTION 33 14 13 WATER PIPE AND FITTINGS

PART 1 – GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material, and equipment necessary to install water main piping together with all appurtenances as shown and detailed on the Drawings and specified herein.

1.02 RELATED WORK

- A. Division 31 “Excavating, Backfilling and Compacting for Utilities”.
- B. Division 33 “Water Valves and Gates”.
- C. Division 33 “Disinfection of Potable Water Pipe”.

1.03 RELATED DOCUMENTS

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

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE (DIP) AND FITTINGS

- A. Ductile iron pipe (DIP) shall conform to ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 Standard. The pipe shall conform to pressure class 350 minimum unless noted otherwise. All fittings and joints should be capable of accommodating pressure of not less than 250 psi. DIP is required for all new water mains 14-inch diameter and larger and for all fire hydrant lateral and fire service lines.
- B. Fittings shall be ductile iron in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings and shall conform to the details and dimensions shown therein. Fittings shall have rubber gasket joints meeting the requirements of AWWA C111. Fittings shall be cement-mortar lined and bituminous coated to conform to the latest revision of ANSI/AWWA standards.
- C. DIP shall be installed within 200 feet of fuel station or contaminated soils. Joints shall be installed with petroleum resistant nitrile gaskets.
- D. Ductile iron mechanical joint fittings shall be in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 (or A21.53 for compact fittings) and have joints in accordance with ANSI/AWWA C111/A21.11. Fittings and joints shall be supplied with all accessories.

- E. Flanged fittings, in general, shall be ANSI pattern using long radius elbows except where space limitations prohibit the use of same. Design of all fittings, whether long or short pattern, shall be as indicated or dimensioned on the Drawings. Special fittings, wall pipes, and sleeves shall conform to the dimensions and details shown on the Drawings.
- F. All mechanical joint fittings and valves shall be restrained with a friction type retainer gland, as manufactured by Ford, Romac or approved equal.
- G. All fittings shall use AWWA C111 nuts and bolts.
- H. Nuts and bolts for above grade flanged and mechanical joint connections shall be 304 or 316 stainless steel.
- I. All ductile fittings shall be rated at 250 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grade 70-50-05 per ASTM Specification A339-55.
- J. 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.
- K. 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.
- L. Ductile iron pipe and fittings shall be as manufactured by U.S. Pipe & Foundry Company, American Cast Iron Pipe Company, or approved equivalent.

2.02 POLYVINYL CHLORIDE (PVC) WATER PIPE - C.I. PIPE SIZE

- A. This pipe shall meet the requirements of AWWA C900-75 for Polyvinyl Chloride (PVC) Pressure Pipe. The pipe shall be PVC 1120 pipe with cast iron pipe equivalent ODs. Pressure class (PC) 235 pipe shall meet the requirements of DR 18 and PC 305 pipe meet the requirements of DR 14.
- B. Provisions must be made for expansion and contraction at each joint with a rubber ring. The bell shall consist of an integral wall section with a solid cross-section rubber ring which meets the laboratory performance of ASTM D3139. The bell section shall be designed to be at least as strong as the pipe wall.
- C. Standard laying lengths shall be 20 feet + for all sizes. At least 85 percent of the total footage of pipe of any class and size shall be furnished in standard lengths, the remaining 15% in random lengths. Random lengths shall not be less than 10 feet long. Each standard and random length of pipe shall be tested to four times the class pressure of the pipe for a minimum of 5 seconds. The integral bell shall be tested with the pipe.
- D. Fittings for all lines shall be ductile iron and in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings. Cement mortar lining and seal coating shall be in accordance with

ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C110/A21.10. All fittings shall be rated at 250 psi water working pressure plus water hammer and be ductile cast-iron grade 70-50-05 per ASTM Specification A339.

- E. All fittings and valves shall be restrained with a friction type retainer gland, as manufactured by Ford, Romac or approved equal.
- F. 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 and include the cost of the fittings and installation in the unit price for pipe.

PART 3 - EXECUTION

3.01 LAYING DEPTHS

In general, water mains shall be laid with a minimum cover of 36 inches and a maximum depth of 60 inches, except as otherwise indicated on the Drawings. Under existing and future highway ditches the cover depth shall be 48 inches, as measured from the ditch flowline to the top of pipe.

3.02 SEWER/CONTAMINANT PIPE CROSSING

- A. At locations shown on the Drawings, required by the Specifications, or as directed by the Engineer, encasement shall be used when the clearance between the proposed water pipe and any existing sewer or contaminant carrying pipe is 18 inches or less. Contaminant carrying pipe includes underground petroleum, slurry, food processing, and other pipe as determined by the Engineer. Encasement may be concrete or an encasement pipe.
- B. Whether the proposed water pipe is above or below the existing sewer/contaminant pipe, the concrete shall fully encase the sewer/contaminant pipe and extend to the spring line of the water pipe. Encasement shall extend in each direction along the sewer/contaminant pipe until the encased sewer/contaminant pipe is 10 feet from the proposed water main, measured perpendicular to the water main.
- C. The pipe segment of the water main shall be installed so that it centers at the crossing with the contaminant pipe.
- D. Concrete shall be 3,000 psi and shall be mixed sufficiently wet to permit it to flow between and under the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade or line of either pipe or damage the joints. Sack concrete is not acceptable.
- E. Concrete for this Work is not a separate pay item and will be considered incidental to water pipe installation.

3.03 PIPE LAYING

- A. Slip Jointed Pipe:

1. All pipes shall be laid with ends abutting and true to the lines and grades indicated on the plans. Pipe shall be fitted and matched so that when laid in the Work, it will provide a smooth and uniform invert. Supporting of pipe shall be as set out in Division 31 and in no case shall the supporting of pipe on blocks be permitted.
2. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure it is clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fittings 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. Bevel can be made with hand or power tools.
3. Joint deflection for slip joint or mechanical joint pipe shall be no more than 75% of the maximum deflection recommended by the manufacturer. No pipe bending on 4-inch or larger. Joint deflection must be shown on shop drawing submittals.
4. The interior of the pipe, as the Work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted so as to exclude earth or other material and precautions taken to prevent floatation of pipe by runoff into trench.
5. Anchorage of Bends:
 - a. At all tees, plugs, valves, caps and bends of 11-1/4 degrees and over, and at reducers or in fittings where changes in pipe diameter occur, movement shall be prevented by providing both a friction type restrainer gland and poured concrete thrust blocking. Thrust blocks shall be as shown on the Drawings, with sufficient volumes of poured concrete being provided; however, care shall be taken to leave weep holes unobstructed and allow for future tightening of all nearby joints. Unless otherwise directed by the Engineer, thrust blocks shall be placed so that pipe and fitting joints will be accessible for repair. Polyethylene wrap shall be provided around all fittings, including retainer glands before pouring concrete thrust blocks. Sack concrete is not acceptable.
 - b. No extra pay shall be allowed for work on proper anchorage of pipe, fittings or other appurtenances. Such items shall be included in the price bid for the supported item.
6. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has the opportunity to make an inspection of the joints, alignment and grade in the section laid, but such inspection shall not relieve the Contractor of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later.
7. All joint surfaces shall be cleaned immediately before jointing the pipe. The joint shall be lubricated in accordance with the pipe manufacturer's recommendations. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. All pipe shall be provided with home marks to insure proper gasket seating. Details of gasket installation and joint assembly shall follow the manufacturer's direction for the joint type and material of the pipe. The resulting joints shall be watertight and flexible.

3.04 TESTING OF WATER PIPE

- A. The completed work shall comply with the provisions listed herein, or similar requirements which will insure equal or better results. Suitable test plugs, water pump or other equipment and apparatus, and all labor required to properly conduct the tests shall be furnished by the Contractor at no expense to HCWD1.
- B. Only HCWD1 personnel are permitted to operate active hydrants and valves. There will be no charge to the Contractor for water or labor for contracts with HCWD1.
- C. Water main piping shall be pressure tested to 250 percent of the normal system operating pressure or to 100 percent of the rated working pressure of the pipe, whichever is less. At no time shall the test pressure exceed 100 percent of the pipe's rated working pressure. A chart recorder provided by HCWD1 shall be installed on the pump discharge connection to the new water main to record pressure and time. A pipe section shall be accepted if the test pressure does not fall more than 5 psi during the minimum 2-hour test period. The pipe shall be tested for allowable leakage according to AWWA C-600 or C-605, as applicable, concurrently with the pressure test.
- D. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 6,000 feet. Testing shall proceed from the source of water toward the termination of the line. The line shall be tested upon the completion of the first 6,000 feet. After the completion of two (2) consecutive tests without failure, the Contractor, at his option and with the Engineer's approval, may discontinue testing until the system is complete.
- E. All pipe, fittings and other materials found to be defective under test shall be removed and replaced at the Contractor's expense.
- F. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not located at high points within the test section, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water.
- G. All piping shall be tested for leakage at a pressure no less than that specified for the pressure test. The leakage shall be defined as the quantity of water that must be supplied to the tested section to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. The leakage shall be less than an allowable amount determined by the following equation:

$$\frac{SD(P)^{1/2}}{L}$$

- Where:
- L = 133,200
 - L = allowable leakage (gallons/hour)
 - S = length of pipe tested, in feet
 - D = nominal diameter of pipe (inches)
 - P = test pressure (psig)

- H. Should the sections under test fail to meet the requirements, the Contractor shall

do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation. All visible leaks are to be repaired regardless of the amount of leakage.

- I. If in the judgment of the Engineer, it is impracticable to follow the foregoing procedures for any reason, modifications in the procedures shall be made as required and as acceptable to the Engineer, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

3.06 PLACEMENT OF IDENTIFICATION TAPE

Detectable underground marking tape shall be placed over all water mains as specified DIVISION 31, Excavating Backfilling, and Compacting for Utilities.

3.07 PLACEMENT OF LOCATION WIRE

Detectable underground location wire shall be placed below all non-metallic water main as specified in DIVISION 31, Excavating Backfilling, and Compacting for Utilities.

3.08 DISINFECTION

Granular HTH shall be placed in appropriately measured quantities of each pipe segment to facilitate disinfection, see DIVISION 33, Disinfection of Potable Water Pipe.

END OF SECTION 33 14 13

SECTION 33 14 19 WATER VALVES AND GATES

PART 1 – GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material, and equipment necessary to install valves together with all appurtenances as shown and detailed on the Drawings and specified herein.

1.02 RELATED WORK

- A. Division 31 “Excavating, Backfilling and Compacting for Utilities”.
- B. Division 33 “Water Pipe and Fittings”.

1.03 SUBMITTALS

- A. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer in accordance with the requirements of Section 01 33 00.
- B. The manufacturer shall furnish the Engineer an affidavit stating that the valve and all materials used in its construction conform to the applicable requirements of the latest revision of the applicable AWWA Standard, and that all tests specified therein have been performed and that all test requirements have been met.

1.03 RELATED DOCUMENTS

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

PART 2 - PRODUCTS

2.01 GATE VALVES

- A. All gate valves shall be of the resilient seat type in accordance with the latest revision of AWWA C509 Standard. The valve body, bonnet and gate castings shall be ductile iron or cast iron. The valve shall have a non-rising stem (NRS), fully bronze mounted or stainless steel with o-ring seals. Valve body and bonnet, inside and out, shall be fully coated with fusion bonded epoxy coating in accordance with AWWA C550 Standard. Valves shall have a rated working pressure of 200 psi. Gate valves shall be installed on lines 6-inch through 12-inch.
- B. Gate valves for buried service shall be furnished with mechanical joint end connections,

unless otherwise shown on the Drawings or specified herein. The end connection shall be suitable to receive ductile iron or PVC pipe.

- C. Gate valves for meter pits, pump stations, or other installations as shown on the Drawings shall be furnished with flanged joint and connections, non rising stem and handwheel operator. The gate valve shall have the direction of opening cast on the rim of the handwheel and provided with chain and lock.
- D. Buried service gate valves shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counterclockwise).
- E. Buried service gate valves shall be installed in a vertical position with valve box as detailed on the Drawings. They shall be set vertically and properly adjusted so that the cover will be in the same plane as the finished surface of the ground or street.
- F. Valves shall be those manufactured by Mueller, Kennedy or approved equivalent.

2.02 TAPPING VALVES

- A. Standard MJ x MJ valve, per paragraph 2.01, shall be used with tapping sleeves. Tapping sleeves shall have mechanical joint outlet.
- J. See Detail Sheet W2.01 of Drawings.

2.03 TAPPING SLEEVES

- A. Tapping sleeves shall be stainless steel and capable of containing pressure within the full volume of the sleeve. Sleeve shall be mechanical joint suitable for use with ductile iron or PVC pipe.
- B. Sleeve shall be rated at 200 psi working pressure through 12-inch size and 150 psi for sleeves 14-inch through 24-inch.
- C. Mechanical joint throat section of mechanical joint sleeves through 12-inch size shall conform to MSS SP60 Standard. For throat sections larger than 12 inches, flanged section shall mate valves of same manufacture as sleeves.
- D. Tapping sleeves shall be capable of withstanding their rated pressure without leakage past the side gaskets and end gaskets of the sleeve. Tapping sleeves shall be fast-tap stainless steel with mechanical joint outlet.
- E. Tapping sleeve shall be manufactured by Mueller, Kennedy, M & H, American Flow Control or approved equivalent.

2.04 BUTTERFLY VALVES

- A. For Valves less than 14-inch:
 - 1. Butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of

AWWA C504. Valves shall be designed for rated working pressure of 150 psi, unless 250 psi valves are shown on the Drawings, directed by RESIDENT PROJECT REPRESENTATIVE, or noted otherwise. The AWWA C504 Section 5.2 testing requirements are modified as follows for valves designed for a rated pressure of 250 psi: the leakage test shall be performed at a pressure of 250 psi; proof of design tests shall be performed and certification of such proof of design test shall be provided.

2. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts shall be 18-8, Type 304 stainless steel, machined and polished. Valve disks shall be ductile iron, ASTM A 536, Grade 65-45-12. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.
 3. Valves shall be equipped with geared actuators with position indicator designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.
 - a. Operator type shall be as shown on the Drawings.
 4. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.
 5. Flanged end connections shall fully conform with ANSIB16.1 for Class 125, Class 250 iron flanges, or AWWA C207 Class D. Both 125 and 250 flanges shall be flat faced. Lug Type end connections shall be designed for installation between ANSI B16.1 Class 150 iron flanges or between ISO 7005-2 PN10 or PN16 flanges.
 6. Butterfly valves shall be manufactured by DeZurik or M&H Valve.
- B. For Valves 14-inch and larger: The butterfly valve shall be DeZurik or M&H Valve Company AWWA C504 series (or approvable equivalent), resilient seat, cast iron body and disk, stainless steel shaft and seating edge (ring), Chloroprene seat, Class 150B, cast iron housing with 2-inch operator nut in vertical position for use with a valve box. The valve shall be fully coated, inside and out, with fusion bonded epoxy in accordance with the latest revision of AWWA C550 Standard.

2.05 SWING CHECK VALVES

- A. The valves shall be designed, manufactured and tested to American Water Works Association Standard ANSI/AWWA C508. The valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372.
- B. The Valves shall be provided with flanges in accordance with ANSI B16.1, Class 125.

- C. The valve body shall be full flow area equal to nominal pipe diameter at all points through the valve. The 4 in. (100mm) valve shall be capable of passing a 3 in. (75mm) solid. The seating surface shall be on a 45 degree angle to minimize disc travel. The valve disc shall be cycle tested 1,000,000 times in accordance with ANSI/AWWA C508 and show no signs of wear, cracking, or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures.
- D. Materials:
 - 1. The valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.
 - 2. The disc shall be precision molded Buna-N (NBR), ASTM D2000-BG.
- E. Support horizontally mounted valves with a system recommended by the manufacturer.
- F. Valves shall be Swing-Flex manufactured by Val-Matic, or pre-approved equal.

2.06 WAFER STYLE CHECK VALVES

- A. Scope: Check Valve shall be of the silent operating type that begins to close as the forward flow diminishes and fully closes at zero velocity preventing flow reversal and resultant water hammer.
- B. Standards:
 - 1. The valves used in potable water service shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372.
 - 2. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.
- C. Connections: Wafer style valves shall be provided in sizes 2 in (50 mm) through 10 in. (250 mm) for installation between ASME B16.1 Class 125 or Class 250 iron flanges or sizes 50mm to 100 mm in accordance with ISO 7005 PN10 or PN16. Stainless steel wafer style valves shall include raised faces for installation between ASME B16.5 Class 150 flanges.
- D. Design:
 - 1. The valve design shall incorporate a center guided, spring loaded disc and having a short linear stroke that generates a flow area equal to the nominal valve size.
 - 2. The operation of the valve shall not be affected by the position of installation. The valve shall be capable of operating in the horizontal or vertical positions with the flow up or down. Heavy duty springs for vertical flow down installations shall be provided when specified on 14 in. and larger valves.
 - 3. All component parts shall be field replaceable without the need of special tools. Wafer and Globe styles shall be provided with a replaceable guide bushing held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi.
 - 4. The wafer and globe disc shall be concave to the flow direction providing for disc stabilization, maximum strength, and a minimum flow velocity to open the valve.

5. The valve disc and seat shall have a seating surface finish of 16 micro-inch or better to ensure positive seating at all pressures. The leakage rate shall not exceed the allowable rate for metal seated valves allowed by AWWA Standard C508 or 1 oz (30 ml) per hour per inch (mm) of valve diameter.
 6. Wafer-style valve seats shall be fully retained with full size threads and sealed with an O-ring. Globe style valve seats shall be contained with a machined counterbore and restrained by the mating flange and gasket.
- E. Materials:
1. For Class 125 and Class 250 Globe and Wafer valves, bodies shall be ASTM A536 Grade 65-45-12 ductile iron up to 12". For Globe valves 14" and larger, Class 125 bodies shall be ASTM A126 Class B cast iron and Class 250 bodies shall be ASTM A536 Grade 65-45-12. ASTM A536 Grade 65-45-12 ductile iron is an optional body material for 14" and larger Class 125 Globe valves. Bodies for Class 150 stainless steel valves shall be ASTM A351 Grade CF8M.
 2. Globe and wafer seat and disc shall be ASTM B584 Alloy C87600 lead-free bronze or ASTM B148 Alloy C95500 aluminum bronze. Optional trim material includes ASTM A351 Grade CF8M stainless steel.
 3. Globe and wafer compression spring shall be ASTM A313 Type 316 stainless steel with ground ends.
 4. A resilient seal shall be provided on the seat to provide zero leakage at both high and low pressures without overloading or damaging the seal. The seal design shall provide both a metal-to-metal and a metal-to-resilient seal.
- F. Testing, Coating, and Manufacturer:
1. The valves shall be hydrostatically tested at 1.5 times their rated cold working pressure and seat tested at the valve CWP. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.
 2. The exterior of the valve shall be coated with a universal alkyd primer.
 3. Valves shall be Series #1400A Wafer Style Silent Check Valve by Val-Matic, or approved equal.

2.07 AIR RELEASE AND AIR/VACUUM VALVES

- A. Air release valves shall be installed at high points along the water main as shown on the Drawings and directed by the Engineer. Size shall be determined by main size and operating pressure. Valve shall be manufactured by Valve and Primer Corp, APCO Series 200A or approved equivalent.
- B. The valves shall be in accordance with ANSI/AWWA C512.
- C. At air release valve locations the water line or force main shall be installed at 48-inch cover. The increase in depth shall be gradual toward and away from the valve installation.
- D. Valves shall be constructed of cast iron body and cover, stainless trim and float with a Buna-N seat for positive seating. The baffle shall be ductile iron and shall protect float from direct impact of air and water. The seat shall slip fit into the baffle or cover and lock in place without any distortion. The float and baffle assembly shall be shrouded with a water diffuser. The float shall be stainless steel center guided for positive seating and be

rated at 1,000 psi non-shock service.

- E. The discharge orifice shall be fitted with a double-acting throttle device to regulate and restrict air venting.
- F. All parts of the valves and the operating mechanisms shall be made of non-corrodible materials.

2.08 REDUCED PRESSURE ZONE BACKFLOW PREVENTOR

- A. Backflow preventors shall have FDA approved epoxy coated cast iron check valve bodies with bronze seats, and FDA approved epoxy coated cast iron relief valve with stainless steel trim. Test cocks shall be bronze body ball valves. Features shall include replaceable bronze seats, non-rising stem resilient wedge gate valve shut-offs, epoxy coated check and relief valves (inside and out), and stainless steel internal parts.
- B. Backflow preventors shall be suitable for continuous use for water supply pressure to 175 psi and water temperature up to 110 degrees Fahrenheit. They shall comply with the latest revision of AWWA C-511.
- C. Markings shall be in accordance with AWWA C-508 and include size, working pressure, and cast arrow to indicate direction of flow, name of manufacturer, and year of manufacturer.
- D. End configurations shall be furnished with 125 pound ANSI flanged ends with accessories.
- E. Painting the inside and outside of all valves, together with the working parts except bronze and machined surfaces, shall be coated in accordance with the latest revision of AWWA C-550.
- F. The backflow preventor shall be Series 909 Reduced Pressure Zone Backflow Preventor as manufactured by WATTS Regulator, or an acceptable equivalent product.

2.09 VALVE BOXES

- A. Each buried stop and valve shall be provided with a suitable valve box. Boxes shall be of the screw type, adjustable, telescoping, heavy-pattern type with the lower part of cast iron and the upper part of steel or cast iron. They shall be so designed and constructed as to prevent the direct transmission of traffic loads to the pipe or valve.
- B. The upper or screw section of the box shall be provided with a flange having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and rest on the valve bonnet.
- C. The boxes shall be adjustable through at least 6 inches vertically without reduction of the lap between sections to less than 4 inches.
- D. The inside diameter of boxes for valves shall be at least 4-1/2 inches, and the lengths shall be as necessary for the depths of the valves or stops with which the boxes are to be used.

- E. Covers for valves shall be close fitting and substantially dirt-tight. The top of the cover shall be flush with the top of the box rim. An arrow and the word OPEN to indicate the direction of turning to open the valve shall be cast in the top of the valve covers with "WATER" cast into lid.
- F. A 24-inch square concrete collar, 4-inches thick shall be installed around the cover in earth areas.

2.10 COUPLING ADAPTER

- A. The pipe couplings shall be of a gasketed, sleeve-type with diameter to properly fit the pipe. Each coupling shall consist of one (1) steel middle ring, of thickness and length specified, two (2) steel followers, two (2) rubber- compounded wedge section gaskets and sufficient track-head steel bolts to properly compress the gaskets. Field joints shall be made with this type of coupling. The middle ring and followers of the coupling shall be true circular sections free from irregularities, flat spots, or surface defects. They shall be formed from mill sections with the follower-ring section of such design as to provide confinement of the gasket. After welding, they shall be tested by cold expanding a minimum of 1 percent beyond the yield point. The coupling bolts shall be of the elliptic-neck, track-head design with rolled threads. The manufacturer shall supply information as to the recommended torque to which the bolts shall be tightened. All bolt holes in the followers shall be oval for greater strength. The gaskets of the coupling shall be composed of a crude or synthetic rubber base compounded with other products to produce a material which will not deteriorate from age, from heat, or exposure to air under normal storage conditions. It shall also possess the quality of resilience and ability to resist cold flow of the material so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature or other adjustments of the pipe line. The couplings shall be assembled on the job in a manner to insure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement, unavoidable variations in trench gradient, etc.
- B. Nuts and bolts shall be in accordance with AWWA C111.
- C. Couplings shall be shop primed and field painted in accordance with Division 9 (or one coat of coal tar epoxy if not specified in Division 9).
- D. Compression couplings shall be equivalent to Style 38 manufactured by Dresser. Flanged couplings shall have flanges in accordance with AWWA C207 and be equivalent to Style 128 manufactured by Dresser.

2.11 FIBERGLASS LINE MARKER FOR BURIED VALVES

- A. General:
 - 1. Design: The continuous fiberglass reinforced composite line marker shall be a single piece marker capable of simple, permanent installation by one person using a manual driving tool. The marker, upon proper installation, shall resist displacement from wind and vehicle impact forces. The marker shall be of a constant flat "T" cross-sectional design with reinforcing support ribs incorporated longitudinally

along each edge to provide sheeting protection and structural rigidity. The bottom end of the marker shall be pointed for ease of ground penetration.

2. **Material:** The marker shall be constructed of a durable, UV resistant, continuous glass fiber and marble reinforced, thermosetting composite material which is resistant to impact, ozone, and hydrocarbons within a service temperature range of -400 F to +1400 F.
3. **Marking:** Each marker shall be permanently marked "Water Line Below." The letters shall be a minimum of 2 inches in height. A black line shall be stamped horizontally across the front of the marker near the bottom to indicate proper burial depth as shown in the standard detail. The marker shall be a CRM-375 as manufactured by Carsonite International, or approved equivalent.

B. Physical and Mechanical Requirements:

1. **Dimensions:** The marker shall conform to the shape and overall dimensions shown in the standard detail.
2. **Mechanical Properties:** The marker shall have the minimum mechanical properties as follows:

Property	ASTM Test Method	Minimum Value
Ultimate Tensile Strength	D-638	50,000 psi
Ultimate Compressive Strength	D-638	45,000 psi
Specific Gravity	D-792	1.7
Weight % Glass Reinforcement	D-2584	50%
Barcol Hardness	D-2583	47

3. **Color Fastness:** The marker shall be pigmented throughout the entire cross-section so as to produce a uniform color which is an integral part of the material. Ultraviolet resistant materials shall be incorporated in the construction to inhibit fading or cracking of the delineator upon field exposure.

C. Reflectors:

1. The reflector shall be of impact resistant, pressure sensitive retro-reflective sheeting which shall be subject to approval by the Engineer. The sheeting shall be of appropriate color to meet MUTCD requirements.
2. **Mounting:** The retro-reflective sheeting shall consist of a minimum of a 3-inch wide strip placed a maximum of 2 inches from the top of the post unless otherwise specified.

2.12 DISMANTLING JOINT

- A. Dismantling joint shall meet AWWA C219 Standard.
- B. Flange spool shall be AWWA C207 Class D or E Steel Ring Flange, compatible with

ANSI Class 125 and 150 bolt circles. Pipe is STD Weight Class per ASTM A53. End Ring and Body shall be made from ASTM A536 65-45-12 Ductile Iron. Shall have a working pressure rating of the proposed piping system.

- C. Gaskets shall be compounded for water and sewer service meeting the requirements of ASTM D 2000.
- D. Bolts and Nuts shall be ASTM A588 HSLA bolt material. Ten inch uses a ductile iron through bolts per ASTM A536 with HSLA heavy hex nuts. Tie Rods shall be high tensile steel per ASTM A193 grade B7.
- E. Coating shall be Fusion bonded epoxy, NSF 61 certified. All surfaces are coated, including flange faces.
- F. Dismantling joints shall be one of the following, or approved equal:
 - 1. ROMAC DJ400,
 - 2. Smith-Blair Style 975, or
 - 3. Approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Valves shall be installed as nearly as possible in the positions indicated on the Drawings consistent with conveniences of operating the handwheel or wrench. All valves shall be carefully erected and supported in their respective positions free from all distortion and strain on appurtenances during handling and installation.
- B. All material shall be carefully inspected for defects in workmanship and material, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness.
- C. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense. Valves shall not be installed with stems below the horizontal.
- D. Valves shall be provided with extension stems where required for convenience of operation. Extension stems shall be provided for valves installed underground and elsewhere so that the operating wrench does not exceed 6 feet in length.

3.02 PAINTING

- A. Valves shall be factory primed and fully coated, inside and out, with fusion bonded epoxy in accordance with the latest revision of AWWA C550 Standard and NSF 61.

END OF SECTION 33 14 19

SECTION 33 14 43
PACKAGED PUMPING SYSTEMS FOR WATER UTILITY SERVICE

PART 1 - GENERAL

1.1 SCOPE

- A. This requirements in this Section relate to the proposed Brizendine Pump Station.
- B. Furnish a factory packaged and tested, duplex variable speed water pressure booster system including pumps, motors, variable frequency drives, controls, valves, instrumentation, interconnecting piping, wiring, HVAC system, pre-fabricated enclosure, and accessories for a complete system.

1.2 WORK SPECIFIED IN OTHER SECTIONS

- A. Division 09 "Paint and Protective Finishes".
- B. Division 22 for identification of piping.
- C. Division 26 electrical requirements.
- D. Division 33 for piping and valve requirements.
- E. Division 40 for instrumentation requirements.

1.2 SUBMITTALS

- A. Product Data:
 - 1. Provide manufacturer's literature including general assembly, pump curves showing performance characteristics with pump and system with operating point indicated, NPSH curve, controls, wiring diagrams, and service connections. Include cutsheets for all equipment included with the package station.
- B. Operation and Maintenance Data:
 - 1. Operation Data: Include manufacturer's instructions, start-up data, troubleshooting checklists, for pumps, drivers, instrumentation, and controllers.
 - 2. Maintenance Data: Include manufacturer's literature, cleaning procedures, replacement parts lists, and repair data for pumps, drivers and controllers, preventative maintenance schedule, preventative maintenance recommendations and procedures. Identify place of purchase, location and contact numbers of service department and technical support for each product listed.

1.3 TRANSPORTATION AND HANDLING

- A. Components shall be delivered to the site in factory packing.

- B. Protect pumps and components from physical damage including effects of weather, water, and construction debris. Provide temporary inlet and outlet caps.

1.4 QUALITY ASSURANCE

- A. All equipment under this section shall be furnished by a single supplier and shall be products that the manufacturer regularly engages in. The supplier shall have sole responsibility for proper functioning of the system and equipment supplied.
- B. The manufacturer of the water pumping system shall be responsible for compliance with all applicable codes and regulations and be held accountable for the complete pump package.

1.5 RELATED DOCUMENTS

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

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. All materials that may come in contact with the potable water shall comply with NSF Standard 61 and NSF Standard 372.
- C. Pressure ratings of pumps, pipe fittings, valves, gauges and all other water carrying appurtenances shall be suitable for the anticipated system pressures in which they are installed.
 - 1. System pressure rating = 250 PSIG.
 - 2. Maximum design operating pressure = 150 PSIG.
- D. The booster system shall be factory assembled on a steel skid including pumps, motors, valves, interior piping, HVAC, and enclosure.
- E. Suction and discharge piping manifolds shall be of flanged cement lined ductile iron pipe In accordance with Division 33. Individual pumps, motors and check valves shall be serviceable with the booster system in operation.
- F. All skid-mounted components shall be factory finished in high quality epoxy or enamel paint. The base shall be suitable for grouting.
- G. The packaged pumping system shall be tested at the factory prior to shipment. See Paragraph 3.1.

2.2 STRUCTURE

- A. The design of the enclosure, skid, and foundation is a delegated design that shall be performed by an engineer registered in the Commonwealth of Kentucky. Plans, specifications, and calculations shall be stamped and submitted to Owner & Engineer for review.
- B. Enclosure and skid shall be fabricated, welded, structural steel construction. Steel shall meet the requirements of ASTM A36. Enclosure shall be ¼-inch minimum steel plate. Skid shall be equipped with anti-floatation anchors.
- C. Enclosure shall be designed to applicable building and structural codes. Structural design shall be for “light duty/non-traffic” surface grade loadings.
- D. All interior and exterior steel structure surfaces shall be coated in accordance with Division 09. Interior coating shall be white in color.
- E. Pipe Penetrations:
 - 1. Station shall be equipped with the quantity and size of penetration to accommodate the water pipe, sump pump piping, ventilation, and electrical penetrations shown on the Drawings.
 - 2. All pipes penetrating any fixtures of the station structure must be encased in a Schedule 40 Steel Sleeve. A water tight seal created by a mechanical link seal and with gaps caulked.
 - 3. Mechanical seals shall be made of nylon polymer with 304 or 316 stainless steel bolts. Manufacturer shall be LINK-SEAL Model “S61” or approved equal.
- F. Cathodic Protection System:
 - 1. Structure shall be equipped with a cathodic protection system with sacrificial anodes and testing station. System shall be designed by a person certified in cathodic protection design.

2.3 ADDITIONAL EQUIPMENT

- A. Access Hatch:
 - 1. Shall be of aluminum construction rated for a 300-psf live load.
 - 2. Hardware including hinges, slam lock, handle, fasteners shall be stainless steel.
 - 3. Shall be equipped with an OSHA rated fall-protection grate or netting for when the hatch is left open.
 - 4. Shall be pad lockable.
 - 5. Hatch shall be located directly above the pumps and large enough so as to allow for their removal via a crane, and also be large enough to allow for personnel entry down the ladder.
- B. Ladder:
 - 1. Shall be of aluminum construction with a mill finish meeting ASTM B-429 or B-221.
 - 2. Designed to meet the requirements of OSHA and ANSI A14.3.
 - 3. Rungs shall have non-slip top surfaces.
 - 4. Shall be equipped with a ladder-up safety post that is painted “safety yellow”.
- C. HVAC:
 - 1. Gooseneck ventilation piping w/ bug screen: One inlet, one outlet for blower.
 - 2. Equipped with a digital thermostat for control of the blower and monitoring by SCADA.

3. Equipped with a ventilation blower that shall be sized to provide the number of air changes per hour required by OSHA and AIHA. Blower shall be setup for automatic operation and status monitored via SCADA; see the Station Operation paragraphs below for additional requirements.
3. Equipped with an automatic dehumidifier with a digital hygrometer. The dehumidifier's discharge shall drain to enclosures sump pump.
4. Equipped with an automatic digital infrared space heater with fan.

D. Sump Pump:

1. Shall be a packaged system set below the finished floor of the enclosure and be operated by an replaceable float switch.
2. Discharge pipe shall be Schedule 40 PVC (minimum) and sized by the pump supplier.
3. Status shall be monitored by SCADA; see the Station Operation paragraphs below for additional requirements.

2.4 ELECTRICAL

A. System requirements:

1. Fabricated structure shall be pre-wired for lights, switches, outlets, conduit, and junction boxes.
2. All electrical systems are surface mounted.
3. All electrical components shall be installed and wired in conformity to the latest edition of all applicable electrical codes.
4. See Division 26 for additional requirements for the electrical system.

B. Components:

1. Interior Lighting:
 - a. Warm white, vapor-tight, LED fixtures.
 - b. Fixtures shall be suitable for use in wet/damp environments.
2. Receptacles:
 - a. Provide a total of one 20-A GFCI receptacles.
 - b. NEMA configuration 5-20R with weatherproof cover.
3. Wall Switch:
 - a. Provide one single-pole, 20-A light switch.
 - b. Toggle style switch with weatherproof cover.
4. Junction Box:
 - a. Provide one PVC junction box for a power termination/connection point for prewired components.
 - b. Box shall be large enough to contain all wiring and connections necessary inside with lid securely in place.
5. Conduit:
 - a. Provide in accordance with Division 26 Electrical: Schedule 40 PVC.

2.5 PUMPS AND MOTORS

A. Shall be of vertical, multi-stage centrifugal design.

B. Operating Design Conditions Shall be capable of supplying both primary and secondary design conditions:

1. Primary Design Condition:
 - a. Design Flow Rate: 150 gpm.
 - b. Design Total Dynamic Head: 199 feet.

- c. Minimum Hydraulic Efficiency: 70%.
 - d. Static Head: 198 feet.
 - e. Rated Motor Horsepower: 15 hp.
 - f. Rated Motor Speed: 3,600 rpm (nominal).
2. Secondary Design Condition:
- a. Design Flow Rate: 60 gpm minimum.
 - b. Design Total Dynamic Head: 77 feet.
 - c. Static Head: 77 feet.
 - d. Motor Speed: At or above minimal acceptable speed via VFD operation.
- C. Mechanical seals shall have carbon vs. silicon carbide seal faces and 316 stainless steel metal parts.
- D. Motors shall be Open Drip Proof design and manufactured to NEMA Premium Efficiency standards and suitable for operation with Variable Frequency Drive.
- E. Each motor shall be equipped with the manufacturer's nameplate and shall have a sufficient horsepower rating to operate the pump at any point on the pump's head-capacity curve without overloading the nameplate horsepower rating of the motor, regardless of service factor. The motor shall have a service factor of 1.15.
- F. Each motor shall have static thermistor type high temperature protection embedded in each winding. This shall cause the motor to shut-down and an alarm issued by the PLC upon high temperatures.
- G. Manufacturers:
- 1. Goulds,
 - 2. Grundfos,
 - 3. Or approved equal.
- H. BUTTERFLY VALVES
- 1. See Division 33 "WATER VALVES AND GATES".
- I. CHECK VALVES
- 2. See Division 33 "WATER VALVES AND GATES".
- J. AIR RELEASE VALVES
- 1. See Division 33 "WATER VALVES AND GATES".
- K. VALVE ACTUATOR
- 1. Quarter-turn actuator capable of control of open/close (non-modulating) operation of a butterfly valve. Actuator shall be setup to fail-in-place upon power failure.
 - 2. NEMA 4X enclosure for operation in wet/damp environments.
 - 3. Shall be controlled by the PLC and monitored by SCADA; See Station Operation paragraphs below for additional requirements.
 - 4. Manufacturer shall be Owner standard of AUMA of Pittsburg, PA. Model "SA" or approved recommendation of the supplier.

2.6 STATION OPERATION

- A. Pumps shall operate in a Lead/Standby arrangement. The control panel shall alternate the Lead pump each time the pumps are called to run. If the Lead pump is disabled or fails to run, then the Standby pump shall be called to run.
 - 1. Operator may assign the pumps to be in a fixed or alternating duty sequence.
- B. Lead pump primary control shall be based on the Level in the Brizendine Storage Tank.
 - 1. Lead pump shall be called to run at full speed at Level=8.7 feet and falling and if suction pressure is 47 PSIG or less.
 - 2. Lead pump shall be called to run at minimum speed if suction pressure is 90 PSIG or greater.
 - 3. Lead pump speed shall ramp linearly between the full and minimum speed levels based on suction pressures listed above.
 - 4. All pumps shall be called to stop at Level=16.7 feet and rising.
- C. Lead pump secondary control shall be based on the signal from the discharge pressure transducer.
 - 1. Lead pump shall be called to run at discharge pressure=115 PSIG and falling.
 - 2. Lead pump shall be called to stop at Pressure=125 PSIG and rising.
 - 3. Lead pump speed is controlled based on suction pressures noted above.
 - 4. All pumps shall be stopped if Pressure=130 PSIG and rising.
- D. High Suction Pressure Control – Override all other control sequences, except HAND operation, with the following:
 - 1. All pumps shall be stopped and not allowed to run if:
 - a. Suction pressure is 100 PSIG or greater;
 - b. Suction pressure switch is tripped (initial setting is 110 PSIG).
 - 2. Issue an alarm to operators of a High Suction Pressure condition.
- E. Pump Motor:
 - 1. The pumps' motor shall be equipped such that if a motor shuts down due to overheating, an alarm shall be issued by the PLC and SCADA. At which time, the Standby pump shall be called to run.
 - 2. If a pump fails to run after being commanded for whatever reason, an alarm shall be issued and the Standby pump shall be called to run.
- F. Ventilation Blower Control:
 - 1. The ON/OFF of the ventilation blower shall be controlled by the PLC to maintain proper temperatures in the station and ventilate the space when occupied. Controls shall include the following features:
 - a. Thermostat to turn on and off blower when temperature inside the enclosure reaches setpoints. Initial setpoints are: ON=80-degrees; OFF=75-degrees.
 - b. Door limit switch to turn on the blower when the access hatch is opened and off when closed.
- G. Discharge Valve Control:
 - 1. The OPEN/CLOSE of the actuated discharge valve shall be controlled by the PLC to prevent the free movement of water through the station when the pumps are not running. Controls shall include the following features:
 - a. The valve shall be called to OPEN when the lead pump is called to run.
 - b. The valve shall be called to CLOSE on a time delay after the pumps are called to stop. Initial setpoint for time delay is 5 seconds.

2.7 INSTRUMENTATION

- A. See Division 40 “Instrumentation for Water Utilities”.

2.8 PROGRAMMABLE LOGIC CONTROLLER

- A. Booster station shall include a PLC capable of performing the described sequence of operation as specified in this specification. The PLC shall include an LCD backlit touchscreen for HMI.
- B. Controller shall be connected to the new SCADA RTU (by others) which will be installed adjacent to the pump control panel. Provide control inputs and outputs from the controller to the RTU as follows using a “dry contact” design:
 - 1. High suction pressure alarm.
 - 2. Discharge pressure.
 - 3. Suction Pressure.
 - 4. Pump 1 amps.
 - 5. Pump 2 amps.
 - 6. Pump 1 status.
 - 7. Pump 2 status.
 - 8. Pump 1 temperature alarm.
 - 9. Pump 2 temperature alarm.
 - 10. Pump 1 run time.
 - 11. Pump 2 run time.
 - 12. Pump 1 speed feedback.
 - 13. Pump 2 speed feedback.
 - 14. Pump 1 call to run.
 - 15. Pump 2 call to run.
 - 16. Communication failure.
 - 17. Power failure.
 - 18. Ventilation blower running/failure.
 - 19. Sump pump running/failure.
 - 20. Access hatch intrusion alarm.
 - 21. Discharge valve open/close status.
 - 22. Discharge Valve failure.
 - 23. Building temperature.
- C. SCADA components and cabinet to be designed and installed by others under a separate contract. Contractor shall coordinate with the SCADA supplier as to the location and required connections for the SCADA cabinet. See the Electrical Drawings for additional requirements.

PART 3 - EXECUTION

3.1 FACTORY TESTING

- A. Pressure Test: Complete booster system shall be hydrostatically pressure tested to 250 psi or 1.5 times the expected operating pressure, whichever is greater, prior to shipment.
- B. Flow Test:

1. Pumps shall undergo a complete hydraulic test from 0 to 100% design flow at the factory with the results submitted to the Engineer for review; or
2. Manufacturer shall submit a certified pump curve of the installed pumps.

3.2 INSTRUCTIONS AND START-UP

- A. Provide the service of a competent factory-trained supervising agent from the pump package manufacturer to inspect the completed installation, start the system and acquaint the operators with the proper operation and maintenance of the equipment.

END OF SECTION

DIVISION 46: FILTRATION EQUIPMENT

SECTION 46 61 00
FILTRATION EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification covers the requirements to furnish all materials, equipment, and labor as required for the gravity multi-media filters. The scope includes but is not limited to underdrains, backwash troughs, air scour piping & fittings, complete with all related appurtenances.

1.2 SUBMITTALS

- A. Conform to the requirements of Section 01 33 00, "SUBMITTAL PROCEDURES".
- B. Submit to the Engineer, technical product literature, shop drawings, installation requirements, and warranty information.

1.3 QUALITY ASSURANCE

- A. The manufacturer shall provide written certification to the Engineer that all products furnished comply with all applicable requirements of these specifications.
- B. All components furnished under this section of the specifications shall be provided by one supplier who shall have unit responsibility for the filtration and air scour system. The equipment shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the detailed drawings and specifications, engineering data, and instructions and recommendations furnished by the equipment manufacturer.
- C. All equipment installed in the filters shall meet NSF 61 Drinking Water Standards.
- D. Filtration equipment manufacturers shall have at least ten years of experience in pumped backwash air scour filters along with a minimum of twenty installations.
- E. Prior to final approval, the manufacturer shall submit a letter certifying the that the installation meets all requirements of the manufacturer.
- F. Manufacturer shall provide a written five year warranty for all filter underdrain/air scour equipment.

1.4 OPERATING CONDITIONS

- A. The underdrain/air scour equipment shall be capable of operating satisfactorily in the following conditions:
 - 1. Downflow of filtered water up to 5.0 gpm/sq.ft.
 - 2. Equal distribution of air at maximum rate of 2.0 scfm/sq.ft.

3. Equal distribution of air together with backwash water at 2.0 scfm/sq.ft. and 8.0 scfm/sq.ft.
4. Equal distribution of backwash water at rates up to 20 gpm/sq.ft.

1.5 ACCEPTABLE MANUFACTURERS

- A. The underdrain/air scour equipment shall be manufactured by OVIVO USA or AWI Filters.

1.6 RELATED DOCUMENTS

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

PART 2 - PRODUCTS

2.1 GENERAL

- A. New products for Filter No. 4 shall match those of the existing Filter Nos. 1 thru 3.
- B. Manufacturer: Roberts Water Technologies, Media, PA.

2.2 POROUS PLATE UNDERDRAIN

- A. Model: "Tri-Lateral HDPE Underdrain Blocks" by Roberts Water Technologies.
- B. Single supplier shall provide: underdrain blocks, porous plate, flume rebar, endplates, O-rings, and grout strips. Loose grout and epoxies shall be supplied and installed by the contractor per the manufacturer's instructions.
- C. Porous plate underdrain shall be factory-installed using type 316 stainless steel screws.

2.3 WASTEWATER TROUGHS

- A. Troughs shall be fiberglass of dimensions 18-inch wide by 21-inch deep by 21-feet long. Reference the Drawings for dimensions & quantity.
- B. Mounting hardware and trough stabilizers shall be type 304 stainless steel.
- C. Fiberglass shall be ¼-inch thick (average), with smooth finish, no exposed glass fibers, molded-in color with ultraviolet inhibitor. Designed to support applied water loading with deflection not greater than 1/8-inch at the midpoint.

2.4 FILTER MEDIA

- A. Model: "RMP Dual Filter Media" by Roberts Water Technologies.

- B. Silica gravel shall be 3/16-inch x #10.
- C. All filter media shall meet or exceed the latest edition of AWWA B-100 and NSF 61 listed. An extra 1-inch of sand and anthracite shall be furnished for backwashing and skimming of fines. All filter media shall be furnished in super sacks on pallets.
- D. Filter Media Configuration:

Effective Size	Maximum Uniformity Coefficient	Media Type
0.45-0.55mm	1.5	Sand
0.95-1.05mm	1.5	Anthracite

2.5 AIR PIPING

- A. Air piping to be provided by underdrain supplier.
- B. Header/J-Tube assemblies shall be furnished fabricated with a minimum of schedule 5S, type 304 stainless steel including type 304 stainless steel support hardware.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The underdrain anchorage shall be placed in exact accordance with the manufacturer's certified dimension prints and as directed by the manufacturer.

3.2 BACKWASH TROUGHS

- A. Backwash troughs shall be set in place with weir edges to exact elevations as shown on the Drawings. Weir edges shall be leveled to within 1/8" over the entire weir length.

3.3 PIPING AND CONNECTIONS

- A. All gaskets and sealants used during installation of piping and connections shall be suitable for contact with potable water.

3.4 FILTER FLOOR PREPARATION

- A. The concrete filter floor exposed after removing the existing underdrain system shall be cleaned, washed down and an adhesive applied prior to adding new concrete. See contract drawings for depth of new concrete. A maximum of plus/minus 1/8" over the entire filter floor is within tolerance.
- B. Prior to installation of the underdrain system, the underdrain manufacturer's Service Representative shall visit the site ensure floor tolerance is acceptable prior to installation of the new underdrains. Written acceptance shall be provided to the Engineer.

3.5 INSPECTION AND TESTING

- A. Following installation, operating tests will be performed to demonstrate to the Engineer that the equipment is functioning in a satisfactory manner. The Contractor shall make, at the Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

3.6 MANUFACTURER'S SERVICES

- A. Furnish the on-site services of a factory representative for one, eight hour day to inspect the final installation, observe a functional test of the equipment and instruct the Owner's personnel in proper operation of the equipment. The factory representative shall have complete knowledge of proper start-up procedure and maintenance requirements of the equipment.

3.7 CLEANING

- A. Prior to acceptance of the work of this section, thoroughly clean all installed materials, equipment and related areas in accordance with the requirements of Section 01 73 00 of these Specifications.

END OF SECTION 46 61 00