



EXHIBIT A-5

**SPECIFICATIONS AND PLANS PREPARED AND DIGITALLY
SIGNED BY A P.E.**

**PORTIONS EXCLUDED HEREIN SUBMITTED SEPERATELY
FOR CONFIDENTIAL TREATMENT
PURSUANT TO 807 KAR 5:001, SECTION 13**

S P E C I F I C A T I O N S

FOR

NORTHERN KENTUCKY WATER DISTRICT

Taylor Mill Treatment Plant
Upgrades and Improvements
Taylor Mill, Kenton County, Kentucky
Project No. WX21117018

June 2026

GOVERNING BODY

COMMISSIONERS:

DOUGLAS C. WAGNER, CDT - CHAIR
NICHOLAS E. WINNIKE – VICE-CHAIR
GARY E. HOLLAND – SECRETARY
FRED A. MACKE, JR - TREASURER
JOSEPH J. KOESTER – COMMISSIONER
JODY R. LANGE, CPA, CGMA – COMMISSIONER

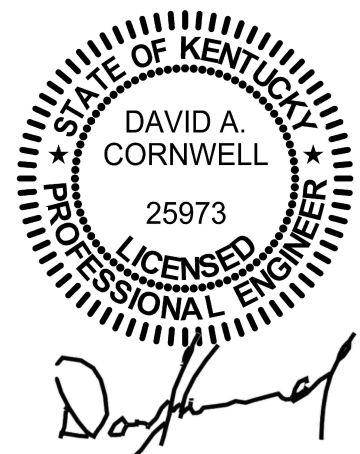
LINDSEY RECHTIN, CPA - PRESIDENT/CEO

COMPILED BY:

Northern Kentucky Water District (Owner)
2835 Crescent Springs Road
Erlanger, Kentucky 41018

PREPARED BY:
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712 Gum Rock Court
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6/5/2026



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Section 00 01 11

NOTICE OF ADVERTISEMENT
KRS 424.145

Northern Kentucky Water District Invitation to Bid – Taylor Mill Treatment Plant Upgrades and Improvements – involves providing ultraviolet disinfection system upgrades, powdered activated carbon system upgrades, concrete repair work, and other water treatment plant improvements.

Access to the Invitation to Bid can be found on the Northern Kentucky Water District website (<https://nkywater.org/procurement>) by clicking the section labeled “Quest CDN Online Interface”. Alternatively potential bidders may contact Cassandra Zoda at czoda@nkywater.org, 859-578-5455, or by visiting 2835 Crescent Springs Rd., Erlanger, KY 41018 for delivery of the Invitation to Bid.

Section 00 11 13

INVITATION TO BID

Date: June 24, 2026 and July 2, 2026

WORK: **Taylor Mill Treatment Plant Upgrades and Improvements,
WX21117018**

BID SUBMISSION: SEALED BIDS WILL BE RECEIVED BY THE NORTHERN KENTUCKY WATER DISTRICT (OWNER) ONLY THROUGH THE ONLINE QUEST CDN WEBSITE (www.questcdn.com)

UNTIL: Date: **July 22, 2026**
Time: **2:00 p.m. (local time)**

At said place and time, and promptly thereafter, all Bids that have been duly received will be opened. Entities on the registered list of plan holders will be sent a link to attend the virtual bid opening. The public may access the virtual bid opening by emailing Cassandra Zoda at czoda@nkywater.org to get the meeting number and password.

BRIEF PROJECT DESCRIPTION: The proposed Work is generally described as follows:

Base Bid Item 1 (Non-SRF Scenario): Ultraviolet (UV) disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV treatment system, power supply and control panels, piping, fittings, and appurtenances; and associated electrical and controls work.

Alternate Base Bid Item 1 (SRF Scenario): Ultraviolet (UV) disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV treatment system, power supply and control panels, piping, fittings, and appurtenances; and associated electrical and controls work.

Base Bid Item 2 (Non-SRF Scenario): Powdered Activated Carbon (PAC) system upgrades and improvements work, including: removing and disposing of existing PAC systems and Filter-Aid Polymer systems; furnishing and installing new PAC systems and Filter-Aid Polymer systems; constructing an enclosed area within an existing facility for the PAC systems; and associated structural, mechanical, and electrical/controls work.

Alternate Base Bid Item 2 (SRF Scenario): Powdered Activated Carbon (PAC) system upgrades and improvements work, including: removing and disposing of existing PAC systems and Filter-Aid Polymer systems; furnishing and installing new PAC systems and Filter-Aid Polymer systems; constructing an enclosed area within an existing facility for the PAC systems; and associated structural, mechanical, and electrical/controls work.

Base Bid Item 3 (Non-SRF Scenario): Structural concrete repair and rehabilitation work for the interior and exposed exterior surfaces of the flocculation and sedimentation basins as well as inside the below-grade walkway tunnel.

Alternate Base Bid Item 3 (SRF Scenario): Structural concrete repair and rehabilitation work for the interior and exposed exterior surfaces of the flocculation and sedimentation basins as well as inside the below-grade walkway tunnel.

Add Alternate Bid Item 4 (Non-SRF Scenario): Fort Thomas diversion piping modifications, which include removing existing piping, fittings, and appurtenances; furnishing and installing piping, fittings, valves with electric motor actuators, and appurtenances; and associated electrical and controls work. This work shall only be performed if accepted and authorized by the Owner.

Add Alternate Bid Item 5 (SRF Scenario): Fort Thomas diversion piping modifications, which include removing existing piping, fittings, and appurtenances; furnishing and installing piping, fittings, valves with electric motor actuators, and appurtenances; and associated electrical and controls work. This work shall only be performed if accepted and authorized by the Owner.

Add Alternate Bid Item 6 (Non-SRF Scenario): Ultraviolet (UV) LED disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV LED treatment system, piping, fittings, and appurtenances; and associated electrical and controls work. This work shall only be performed if accepted and authorized by the Owner. Bidder will indicate the difference in cost (addition or deduction) on the Bid Disclosure Form (Section 004113) between Add Alternate Bid Item 6 (Non-SRF Scenario) and Base Bid Item 1 (Non-SRF Scenario). The Owner will determine if a medium-pressure UV system or a LED UV system will be furnished and installed with this work using the completed Questionnaire provided in Section 004113 along with the Alternate Bid Price.

Add Alternate Bid Item 7 (SRF Scenario): Ultraviolet (UV) LED disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV LED treatment system, piping, fittings, and appurtenances; and associated electrical and controls work. This work shall only be performed if accepted and authorized by the Owner. Bidder will indicate the difference in cost (addition or deduction) on the Bid Disclosure Form (Section 004113) between Add Alternate Bid Item 7 (SRF Scenario) and Alternate Base Bid Item 1 (SRF Scenario). The Owner will determine if a medium-pressure UV system or a LED UV system will be furnished and installed with this work using the completed Questionnaire provided in Section 004113 along with the Alternate Bid Price.

After evaluating the base bid items, the Owner reserves their right to accept or reject the add alternate bid items and to whether or not include this option as part of the Contract. If accepted, then the add alternative work to be included will become part of the Contract Documents. However, should the Owner not authorize, then the add alternative work will not be part of the Contract Documents.

Owner reserves the right to request any clarifying information it deems necessary from Bidders and any chosen Contractor related to the work (including information related to permitting, testing, etc.).

PROJECT DOCUMENTS: All Bids must be in accordance with the Instructions to Bidders and Contract Documents on file, and are available for examination virtually as described below.

To view the bid documents, go to [Northern Kentucky Water District \(nkywater.org/procurement\)](http://nkywater.org/procurement) in the section labeled "Procurement Items" at the top of the page and click the link to be click the link titled "NKWD's Quest CDN Webpage" to be redirected to the Quest CDN Electronic Bid Online Interface.

This bid is listed as Quest eBid Doc # **9213594**.

The project documents may be downloaded by registering with Quest CDN online at www.questcdn.com or by calling 952-233-1632. After registration is complete, an On-Line Bid ID code must be created by clicking on "My Account", then the "User Info" tab. A prospective bidder will create this code in the designated field per requirements noted. To be considered a Plan-holder, a bidder must complete registration and download the Proposal Documents in digital form for a \$22.00 charge. There will be a charge of \$42.00 to submit a bid. Plan-holders will receive addenda and other proposal document updates via Quest CDN. Prospective bidders must be on the plan holders list through Quest CDN for a bid to be accepted.

A non-mandatory pre-bid meeting will be held on **June 30, 2026 starting at 11:00 a.m.** in the meeting room at the Taylor Mill Treatment Plant (608 Grand Avenue, Taylor Mill, KY 41015). Prospective bidders are not required to attend although attendance is highly encouraged. Following the meeting attendees will be afforded the opportunity to orient themselves to the site and work areas as well as ask additional questions.

Outside of the scheduled pre-bid meeting, all inquiries must be submitted in writing to Mr. Gerald Wright with the Cornwell Engineering Group, Inc. (712 Gum Rock Court, Newport News, Virginia 23606, Email: gwright@cornwellinc.com) **before the COB on July 16, 2026**. Please include Mrs. Cassandra Zoda for any inquiries submitted (Email: czoda@nkywater.org). All responses as well as the pre-bid meeting minutes will be provided by addendum.

FUNDING: This project may be funded by the Kentucky Drinking Water State Revolving Fund (SRF) with federal funds provided by the Environmental Protection Agency and Kentucky Infrastructure Authority. Alternate bid items are included to allow for SRF funding.

BIDDER QUALIFICATIONS & AWARD: Bids will be received as a total sum of all the bid items as described in the Contract Documents. After evaluating all bid items, Owner will determine whether or not the alternative base bid and add alternate bid item will be authorized and included as part of the Work. The Successful Bidder will be advised of the Owner's decision.

Each Bid must contain evidence of Bidder's qualifications to transact business in the State of Kentucky or covenant to obtain such qualifications prior to award of the (NKWD)

Contract. The Bidder's Organization Number from the Kentucky's Secretary of State and principal place of business as filed with Kentucky's Secretary of State must be included where applicable.

Bid security, in the form of an electronic Bid Bond (insuring/bonding company shall be rated "A" by AM Best) in the amount of ten percent (10%) of the maximum total bid price, must accompany each Bid.

The Successful Bidder will be required to furnish a Construction Payment Bond and a Construction Performance Bond (insuring/bonding company shall be rated "A" by AM Best) as security for the faithful performance of the contract and the payment of all bills and obligations arising from the performance of the Contract.

For the SRF alternate bid items, SRF requirements (including American Iron and Steel; Build America Buy America requirements of the Infrastructure Investment and Jobs Act; and the Davis Bacon Act) and provisions must be met by the Bidder and all subcontractors.

For the SRF alternate bid items, SRF requires federal prevailing wage rates to be paid to all employees of the Bidder and all employees of any subcontractor.

For the SRF alternate bid items, all Bidders must comply with the President's Executive Order No. 11246 (Equal Employment Opportunity) as amended, which prohibits discrimination in employment regarding race, creed, color, sex, or national origin.

For the SRF alternate bid items, all Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours Standard Act.

For the SRF alternate bid items, all Bidders, Contractors and Subcontractors must comply with 41 CFR 60-4, in regard to Affirmative Action, to ensure equal opportunity to females and minorities and will apply the timetables and goals set forth in 41 CFR 60-4.

For the SRF alternate bid items, Bidders must make positive efforts to use small, minority, women-owned and disadvantaged businesses.

For the SRF alternate bid items, all Bidders must comply with OSHA (P.L. 91-596) and the Contract Work Hours and Safety Standards Act (P.L. 91-54).

For the SRF alternate bid items, the Successful Bidder and all Subcontractors will be required to conform to the labor standards set forth in the Contract Documents.

For the SRF alternate bid items, this procurement is subject to Kentucky Division of Water Uniform Guidance Contract Requirements set forth in the Contract Documents.

Evaluation of Bids and the awarding of the final contract are subject to the reciprocal preference for Kentucky resident bidders pursuant to KRS 45A.490 to 45A.494 and KAR 200 5:400.

Owner reserves the right to reject any or all Bids, including without limitation the right to reject any or all nonconforming, non-responsive, incomplete, unbalanced, or conditional Bids, to waive informalities, and to reject the Bid of any Bidder if Owner believes that it

(NKWD)

would not be in the best interest of Owner to make an award to that Bidder. Owner also reserves the right to negotiate with the apparent successful Bidder(s) to such an extent as may be determined by Owner.

Small, Minority, and Disadvantaged Business Enterprises are encouraged to bid on this project.

Bids shall remain subject to acceptance for 120 days after the day of bid opening or for such longer period of time to which a Bidder may agree in writing upon request of the Owner. If a Contract is to be awarded, the Owner will give the successful Bidder a Notice of Award during the period of time during which the successful Bidder's bid remains subject to acceptance.

Award of the Contract will be made to the lowest, responsive, responsible bidder as specified in the Instructions to Bidders.

The Northern Kentucky Water District is an Equal Opportunity Employer.

INSTRUCTIONS TO BIDDERS: For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

End of Section

INSTRUCTIONS TO BIDDERS

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

- a. *Bidder* - The individual or entity who submits a Bid directly to Owner.
- b. *Successful Bidder* - The Bidder submitting a responsive Bid to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

2. COPIES OF CONTRACT DOCUMENTS. Complete sets of Contract Documents must be used in preparing Bids; Bidder shall have sole responsibility for errors or misrepresentations resulting from the use of incomplete sets of Bidding Documents.

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

Contract Documents are available electronically via QuestCDN. In accord with NKWD Open Record Policy, planholders may request larger plan drawings in paper form by submitting an [open records request form](#).

3. QUALIFICATIONS OF BIDDERS. Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders to perform the services in accordance with the Contract Documents. To demonstrate Bidder's qualifications to perform the Work, within five days of Owner's request Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be requested by Owner. Bidders who have not, in the Owner's opinion, had sufficient experience in the size and type of work involved may not be considered.

Each Bid must contain evidence of Bidder's qualifications to transact business in the State of Kentucky or covenant to obtain such qualifications prior to award of the Contract. The Bidder's Organization Number from the Kentucky's Secretary of State and principal place of business as filed with Kentucky's Secretary of State must be included where applicable.

Each Bidder must be registered as a plan holder with Owner via QuestCDN. There shall be no substitution of bidders without proper registration with the Owner.

In Section 004113, Bidder shall provide bid costs (in words and numerically) for the bid items that do not have to comply with SRF requirements (Non-SRF) and for those that do have to comply with SRF requirements (SRF alternative bid items). Owner will have the discretion to select either Non-SRF or SRF alternative bid items. Bid costs selected by Owner will be either all Non-SRF or all SRF alternative bid items. SRF alternative bid items shall conform to the requirements as described herein and in other related sections of the Contract Documents.

For the SRF alternate bid items, SRF requirements (including American Iron and Steel and Davis Bacon) and provisions must be met by the Bidder and all subcontractors. SRF requires federal prevailing wage rates to be paid to all employees of the Bidder and all employees of any subcontractor.

For the SRF alternate bid items, all Bidders must comply with the President's Executive Order No. 11246 (Equal Employment Opportunity) as amended, which prohibits discrimination in employment regarding race, creed, color, sex, or national origin.

For the SRF alternate bid items, all Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours Standard Act.

For the SRF alternate bid items, all Bidders, Contractors and Subcontractors must comply with 41 CFR 60-4, in regard to Affirmative Action, to ensure equal opportunity to females and minorities and will apply the timetables and goals set forth in 41 CFR 60-4.

For the SRF alternate bid items, Bidders must make positive efforts to use small, minority, women-owned and disadvantaged businesses.

For the SRF alternate bid items, all Bidders must comply with OSHA (P.L. 91-596) and the Contract Work Hours and Safety Standards Act (P.L. 91-54).

For the SRF alternate bid items, the Successful Bidder and all Subcontractors will be required to conform to the labor standards set forth in the Contract Documents. This procurement is subject to Kentucky Division of Water Procurement Guidance including the Davis-Bacon Act.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE. It is the responsibility of each Bidder, before submitting a Bid, to:

- a. thoroughly examine and study the Instructions to Bidders and the Contract Documents, including any Addenda;
- b. take the opportunity to visit the Site and become familiar with and satisfy Bidder as to the general, local, and site conditions that may affect cost, progress, performance, or furnishing of the Work;
- c. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work;
- d. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Contract Documents;
- e. correlate the information known to Bidder, information and observations obtained from visits to the Site, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents;

- f. promptly give Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Contract Documents and confirm that the written resolution thereof by Owner is acceptable to Bidder; and
- g. determine that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

Bidder shall coordinate and schedule with the District for its own additional sampling prior to or after the submission of the bid packages. The Bidder shall be responsible for any additional sampling as required or for informational purposes.

4.01. Underground Facilities. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner or others, and Owner and Engineer disclaim responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the Supplementary Conditions.

4.02. Additional Information. Before submitting a Bid, each Bidder may, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to subsurface or physical conditions at or contiguous to the Site or otherwise, which may affect cost, progress, performance, or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents. Each Bidder shall be responsible for any claims for personal injury, death or damage to property caused by Bidder's entry on public or private property and shall defend and indemnify Owner and all other parties against any such claims.

4.03. Bidder's Representation. The submission of a Bid will constitute an incontrovertible representation and covenant by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Contract Documents, that Bidder has given Owner written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Contract Documents and the written resolutions thereof are acceptable to Bidder, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

5. NONMANDATORY PRE-BID MEETING. A non-mandatory pre-bid meeting will be held on **June 30, 2026 starting at 11:00 a.m.** in the meeting room at the Taylor Mill Treatment Plant (608 Grand Avenue, Taylor Mill, KY 41015). Prospective bidders are not required to attend although attendance is highly encouraged. Following the meeting attendees will be afforded the opportunity to orient themselves to the site and work areas as well as additional questions.

6. SITE AND OTHER AREAS. The Site is identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

Bidder shall be prepared to make site repairs or restorations for damages caused in the performance of the work by the Contractor or any of its subcontractors.

7. INTERPRETATIONS AND ADDENDA. All questions about the meaning or intent of the Bidding Documents are to be submitted to Owner in writing. Any interpretations or clarifications that are considered necessary by Owner in response to such questions will be issued by Addenda posted to QuestCDN and delivered to all parties recorded by Owner as having received the Bidding Documents. Questions received less than 72 hours prior to the date for opening of Bids may not be answered. The person submitting questions shall be responsible for their prompt delivery. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

Owner will not be responsible for explanations or interpretations of the Bidding Documents or Contract Documents except as issued in accordance herewith.

8. BID SECURITY. Each Bid must be accompanied by Bid security made payable to Owner in an amount of 10 percent of Bidder's maximum Bid price and in the form of a Bid Bond (on the form attached) issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions and shall be rated "A" by AM BEST.

Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may annul the Notice of Award and Bid security of that Bidder will be forfeited. Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or one day after the last day the Bids remain subject to acceptance, whereupon Bid security furnished by such Bidders will be returned.

9. CONTRACT TIMES. The numbers of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

10. LIQUIDATED DAMAGES. Provisions for liquidated damages, if any, are set forth in the Agreement.

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

12. SUBMITTING AN ONLINE BID. Proceed to the QuestCDN website at www.questcdn.com. You will be asked to sign into your account or create a free QUESTCDN account by clicking the 'join' link. Contact QUESTCDN at 952-233-1632 or success@questcdn.com for assistance in membership registration, downloading the project and vbid online bid submittal.

To access the bid form, click the online bidding button at the top of bid advertisement. The on-line bid button will be available when the project is published and open for bidding. There is a fee of \$42.00 to submit your bid.

13. PREPARATION OF BID. In addition to the Bid Worksheet in QuestCDN, the following items are included with the Bidding Documents must be submitted via QuestCDN:

1. Bid Disclosure Form (Section 004113)
2. Certification Regarding Debarment, Suspension and Other Responsibility Matters (EPA Form 5700-49). (Section 008100 - Attachment No. 9)
3. Certification Regarding Lobbying, Certification for Contracts, Grants, Loans and Cooperative Agreements. (Section 008100 - Attachment No. 10)
4. Statement of Bidder's Qualifications (Section 004123 - Attachment No. 1)
5. Bidder's Experience Record (Section 004123 - Attachment No. 2)
6. Proposed Subcontractors (Section 004123 - Attachment No. 3)
7. Bid Security (Section 004313)
8. Non-Collusion Affidavit (Section 004133)
9. Required Notarized Affidavit for Bidders, Offerors, and Contractors Claiming Kentucky Resident Bidder Status (Section 004700)

All blanks on the Bid Disclosure Form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each lump sum bid item and/or unit price item listed therein, or the words "No Bid", "No Change", or "Not Applicable" entered.

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

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

A Bid by a limited liability company shall be executed in the name of the firm by a member (if member-managed) or manager (if manager-managed) and accompanied by evidence of

authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

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

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

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

The QuestCDN system will require Bidders to download and acknowledge all addenda prior to submitting a Bid.

The address, email, and telephone number for communications regarding the Bid shall be shown on the Bid Disclosure Form.

The Bid shall identify whether the Bidder is a resident or nonresident bidder for purposes of Kentucky's reciprocal preference statute (KRS 45A.490 to 45A.494 and 200 KAR 5:400). If the Bidder is claiming a "resident bidder" status as defined in KRS 45A.494(2), the Bid shall include a properly executed and notarized affidavit affirming that it meets the criteria to be considered such a resident bidder. If requested by Owner, Bidder shall also provide documentation proving such resident bidder status; failure to do so shall result in disqualification of the Bidder or contract termination.

While the Bidder should consult the applicable statutes and regulation, generally speaking, a "resident bidder" is an individual or business entity that, on the date the contract is first advertised or announced as available for bidding: (a) is authorized to transact business in the Commonwealth; AND (b) has for one (1) year prior to and through the date of the advertisement, (i) filed Kentucky corporate income taxes, (ii) made payments to the Kentucky unemployment insurance fund established in KRS 341.490, and (iii) maintained a Kentucky workers' compensation policy in effect. A "nonresident bidder" is any other individual or business entity.

14. BASIS OF BID. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. After evaluating all bid items, Owner will determine whether or not the add alternate bid item will be authorized and included as part of the Work. The Successful Bidder will be advised of the Owner's decision. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions and as amended in the Supplemental Conditions.

Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words. Discrepancies between the QuestCDN bid worksheet and the Bid Disclosure Form shall be resolved in favor of the QuestCDN bid worksheet.

15. SUBMITTAL OF BID. A Bid shall be submitted via QuestCDN no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid. Bidder shall assume full responsibility for timely submission of Bids. Bids will not be accepted after the time and date for receipt of Bids. Paper, oral, telephone, facsimile, email, or telegraph Bids are invalid and will not receive consideration.

16. MODIFICATION AND WITHDRAWAL OF BIDS. Prior to the bid opening, a Bid may be modified or withdrawn via the QuestCDN electronic bid service only. For a period ending 72 hours after Bids are opened, any Bidder may request the withdrawal of its Bid by filing with Owner a duly signed written notice and otherwise demonstrating by clear and convincing evidence to the reasonable satisfaction of Owner that the Bid was submitted in good faith but there was a material and/or substantial mistake in the preparation of its Bid. If the withdrawal of the Bid is approved by the Owner in its sole discretion, the Bid security will be returned. Without the advanced full disclosure by the withdrawing Bidder to and written consent of the Owner, (a) no Bid shall be withdrawn under this section when the result would be the awarding of the contract on another Bid of the same Bidder or of another Bidder in which the withdrawing Bidder has a direct or indirect equitable interest and (b) no Bidder who is permitted to withdraw a Bid shall, for compensation, supply any material or labor to or perform any subcontract or other work agreement for the Bidder to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the Project.

17. OPENING OF BIDS. Bids will be opened electronically via Microsoft Teams meeting at the time indicated in the advertisement or Invitation to Bid. 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.

18. BIDS TO REMAIN SUBJECT TO ACCEPTANCE. All Bids will remain subject to acceptance for the period of time stated in the Bid Disclosure Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

19. AWARD OF CONTRACT. Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, non-responsive, incomplete, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder which it finds, after reasonable inquiry and evaluation, to be non-responsive. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Owner to make an award to that Bidder. Owner also reserves the right to waive all and to negotiate with the apparent Successful Bidder(s) to such an extent as may be determined by Owner. The Owner also reserves the right to increase or decrease the quantities of work per the General Conditions.

In evaluating Bids, Owner will consider, among other lawful considerations, the following:

- a. Whether or not the Bid complies with the prescribed requirements, and provides such alternates, unit prices and other information or data as may be requested in the Bid Form or prior to the Notice of Award.
- b. The qualifications of the Bidder.
- c. If the Bidder maintains a permanent place of business.

- d. If the Bidder has adequate personnel and equipment to perform the Work properly and expeditiously.
- e. Bidder's financial status to meet all obligations and incidentals to the Work.
- f. Whether the Bidder has appropriate technical expertise and experience.
- g. Bidder's performance record.
- h. The amount of the TOTAL BASE BID, exclusive of any additive optional bid items, if applicable. Any additive optional bids will be considered after selection of the lowest Total Base Bid. Each additive optional bid will be considered and selected or not selected individually, at Owner's discretion, for inclusion in the work.

In addition, the evaluation of Bids will be subject to the reciprocal preference for Kentucky resident bidders pursuant to KRS 45A.490 to 45A.494 and KAR 200 5:400. These statutes and regulation provide in part as follows: (a) a resident bidder of the Commonwealth shall be given a preference against a nonresident bidder registered in any state that gives or requires a preference to bidders from that state; (b) the preference shall be equal to the preference given or required by the state of the nonresident bidder; (c) this preference shall not be applied against nonresident bidders residing in states that do not give preference against Kentucky bidders; (d) if a procurement determination results in a tie between a resident bidder and a nonresident bidder, preference shall be given to the resident bidder; and (e) the preference shall not result in a nonresident bidder receiving a preference over another nonresident bidder.

Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders to perform the Work in accordance with the Contract Documents, including, without limitation, a Bidder's claim that it is a resident bidder for purposes of Kentucky's preference statute.

20. **CONTRACT SECURITY AND INSURANCE.** Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by such Bonds.

21. **SIGNING OF AGREEMENT.** When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents identified in the Agreement as attached thereto. Within **15 days** thereafter, the Successful Bidder shall sign, leaving the dates blank, and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within **15 days** thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

22. SALES TAX EXEMPTION. The Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by the Successful Bidder which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. The Successful Bidder agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases for the Work.

23. RETAINAGE. Provisions concerning retainage are set forth on the Agreement.

24. DRINKING WATER STATE REVOLVING FUND LOAN. A portion of the funding for this project may come from a Drinking Water State Revolving Fund (DWSRF) loan. This loan originates with the United States Environmental Protection (USEPA) and has several provisions that directly impact the Bidder. These include:

1. A certificate that the Bidder, and any subcontractors used by the Bidder, are not on the Federal List of Debarred Contractors. (CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER MATTERS – EPA Form 5700-49) addresses this item and must be executed and included with the Bid.
2. A certification from the Bidder that no appropriate funds were or will be used for the purposes of lobbying the legislative or executive branches of the Federal government. (CERTIFICATION REGARDING LOBBYING) address this item and must be submitted with the Bid.

The DWSRF loan creates additional documentation requirements on both the Contractor and the Owner. These are set forth in the Supplemental General Conditions for Drinking Water State Revolving Fund Loans (DWSRF Supplemental General Conditions). The items identified, but not limited to, in this section must be submitted with the Bid. The remaining items identified in the DWSRF Supplemental General Conditions Section will be submitted by the low bidder within 21 days of the Bid Opening upon the District's formal request. The project will not be awarded until this information is received.

DWSRF funding requires a recipient to utilize minority or women owned businesses as subcontractors where possible. Certain information and documentation is required by the funding agencies and other governing bodies prior to awarding a necessary approval for this project. The BIDDER acknowledges, through the act of submitting a Bid, a commitment to submit the following documentation or information within 7 days of the Bid Opening. Failure to produce any of this documentation or information within the prescribed period will serve as grounds for rejection of the Bid. If the information is required from a subcontractor or vendor and is not produced within the prescribed, it will serve as grounds to replace the subcontractor or vendor with another company or product.

Specific items to be submitted within 7 days of the Bid Opening upon the District's formal request to do so include:

- A. Disadvantage Enterprise Participation Policy (Attachment 11-Section 008100).
- B. List of DBE Bidders of Subcontractors (Attachment 11-Section 008100).

End of Section

BID DISCLOSURE FORM

WORK IDENTIFICATION: **Taylor Mill Treatment Plant Upgrades & Improvements**

THIS BID IS SUBMITTED ELECTRONICALLY VIA QUEST CDN TO THE NORTHERN KENTUCKY WATER DISTRICT

THIS BID IS SUBMITTED BY: _____
(Bidder's Company Name)

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

Bidder accepts all of the terms and conditions of the Invitation to Bid and the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. Bids shall remain subject to acceptance for the period of time required for the apparent successful Bidder to provide satisfactory evidence to the Owner that the necessary approvals and/or permits required for disposal are in place. The Owner shall have the sole authority to determine what is "satisfactory evidence" of the necessary approvals and/or permits. If a Contract is to be awarded, the Owner will give the successful Bidder a Notice of Award within 90 days of providing such evidence or for such longer period of time to which a Bidder may agree in writing upon request of the Owner. Bidder understands that certain extensions to the time for acceptance of this Bid may require the consent of the surety for the Bid Bond.

Bids shall remain subject to acceptance for the period of time required for the apparent successful Bidder to provide satisfactory evidence to the Owner that the necessary approvals and/or permits required for disposal are in place. If a Contract is to be awarded, the Owner will give the successful Bidder a Notice of Award within 90 days of providing such evidence or for such longer period of time to which a Bidder may agree in writing upon request of the Owner.

2. In submitting this Bid, Bidder represents and covenants, as set forth in the Agreement, that:
 - a. Bidder has examined and carefully studied the Contract Documents, the other related data identified in the Contract Documents, and all Addenda, receipt of all of which is hereby acknowledged.
 - b. Bidder has visited the Site 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. Bidder is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

- d. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary explorations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.
 - e. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
 - f. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
 - g. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
 - h. Bidder has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Owner is acceptable to Bidder.
 - i. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
 - j. Bidder's Organization Number from Kentucky's Secretary of State is #_____ [if applicable] and Bidder is qualified to transact business in the State of Kentucky or hereby covenants to obtain such qualifications prior to award of the Contract.
3. Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.
4. The Bidder understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Site which will allow it to respond to an emergency at the Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Bidder shall provide a list of emergency phone numbers for such purposes. If the Bidder does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does

have such a presence, provided that any such sub-contractor must be approved by the Owner, in its sole discretion, prior to the project pre-construction meeting.

5. Bidder will complete the Work for Bidder's prices entered in the QuestCDN Bid Worksheet. Unit prices will be computed in accordance with paragraph 11.03.B of the General Conditions. Bidder acknowledges that estimated quantities are not guaranteed (and may be increased or lowered), and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities authorized and approved by the Owner, as provided in the Contract Documents or supplemental guidance provided by the Owner.
6. NOTE: The SRF options included as Alternate Base Bid items must include all of the conditions, limitations, processes and any other costs related to providing those bid items strictly in accordance with requirements of the State Revolving Loan Fund. See Section 010170-1.1.E and Section 004113.

**REFERENCE COPY OF BID WORKSHEET. BID PRICING MUST BE SUBMITTED IN THE
QUESTCDN BID WORKSHEET TO BE CONSIDERED**

BASE BID SCHEDULE – TMTP UPGRADES AND IMPROVEMENTS:

Base Bid Item #1: UV Treatment System Upgrades and Improvements (Non-SRF Scenario)

Ultraviolet (UV) disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV treatment system, power supply and control panels, piping, fittings, and appurtenances; and associated electrical and controls work.

Lump Sum Cost, Bid Item #1 (Non-SRF Scenario):

\$ _____

Lump Sum Cost, Bid Item #1 (Non-SRF Scenario) (written out in words)

Alternate Base Bid Item #1: UV Treatment System Upgrades and Improvements (SRF Scenario)

Ultraviolet (UV) disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV treatment system, power supply and control panels, piping, fittings, and appurtenances; and associated electrical and controls work.

Lump Sum Cost, Alt. Bid Item #1 (SRF Scenario):

\$ _____

Lump Sum Cost, Alt. Bid Item #1 (SRF Scenario) (written out in words)

Base Bid Item #2: PAC Storage and Feed System Upgrades and Improvements (Non-SRF Scenario)

PAC system upgrades and improvements work, including: removing and disposing of existing PAC systems and Filter-Aid systems; furnishing and installing new PAC systems and Filter-Aid systems; constructing an enclosed area within an existing facility for the PAC systems; and associated structural, mechanical, and electrical/controls work.

Lump Sum Cost, Bid Item #2 (Non-SRF Scenario):

\$ _____

Lump Sum Cost, Bid Item #2 (Non-SRF Scenario) (written out in words)

Alternate Base Bid Item #2: PAC Storage and Feed System Upgrades and Improvements (SRF Scenario)

PAC system upgrades and improvements work, including: removing and disposing of existing PAC systems and Filter-Aid systems; furnishing and installing new PAC systems and Filter-Aid systems; constructing an enclosed area within an existing facility for the PAC systems; and associated structural, mechanical, and electrical/controls work.

Lump Sum Cost, Alt. Bid Item #2 (SRF Scenario):

\$ _____

Lump Sum Cost, Alt. Bid Item #2 (SRF Scenario) (written out in words)

Base Bid Item #3: Flocculation and Sedimentation Basins Structural Rehabilitation (Non-SRF Scenario)

Structural repair and rehabilitation work for the interior and exposed exterior surfaces of the flocculation and sedimentation basins as well as inside the below-grade walkway tunnel. Fill in the unit costs and total costs for the various repair work items noted in the Repair Schedule below and provide a total sum cost at the bottom. Reiterate the total sum cost written in words and numerically in the spaces provided below the schedule.

REPAIR SCHEDULE (Non-SRF Scenario)					
Repair*	Type	Units	Unit Cost	Estimated Quantity	Total Cost
G	Gravity feed epoxy	LF	\$	350	\$
P	Epoxy injection	LF	\$	100	\$
C	Expansion joint crack repair	LF	\$	245	\$
E	Exposed rebar	LF	\$	16	\$
S	Concrete spall repair	SF	\$	76	\$

B	Remove existing coating system on bottom of floc/sed basins and replace with a new coating system.	SF	\$	7,200	\$
W	Remove existing coating system on walls of floc/sed basins and replace with a new coating system.	SF	\$	35	\$
F	Remove and replace existing failing repair	CF	\$	300	\$
A	Corbel repair	EA	\$	1	\$
T	Apply new coating system to the inside walls of the floc/sed basin troughs	SF	\$	4,500	\$
D	Strip rusted steel to bare metal. Clean steel in accordance with SSPC3 and paint with zinc rich primer before applying new paint system to match existing.	SF	\$	350	\$
U	Underpin the existing concrete pad to at least 2 ft below existing grade	CF	\$	100	\$
R	Existing steel beam has deteriorated at the end and needs to be replaced. Provide a new section and connections to match the existing and install to match the existing. Shore all remaining elements supported by the beam and shall be shored and reattached to the beam.	LS	\$	1	\$
Total Sum Cost, Structural Repair and Rehabilitation Work (Non-SRF Scenario)				\$	
* Refer to Structural Plans and Specifications for location(s) as well as additional clarification and detail					

Total Sum Cost, Bid Item #3 (Non-SRF Scenario):

\$ _____

Total Sum Cost, Bid Item #3 (Non-SRF Scenario) (written out in words)

Alternate Base Bid Item #3: Flocculation and Sedimentation Basins Structural Rehabilitation (SRF Scenario)

Structural concrete repair and rehabilitation work for the interior and exposed exterior surfaces of the flocculation and sedimentation basins as well as inside the below-grade walkway tunnel. Fill in the unit costs and total costs for the various repair work items noted in the Repair Schedule below, and provide a total sum cost at the bottom. Reiterate the total sum cost written in words and numerically in the spaces provided below the schedule.

REPAIR SCHEDULE (SRF Scenario)					
Repair*	Type	Units	Unit Cost	Estimated Quantity	Total Cost
G	Gravity feed epoxy	LF	\$	350	\$
P	Epoxy injection	LF	\$	100	\$
C	Expansion joint crack repair	LF	\$	245	\$
E	Exposed rebar	LF	\$	16	\$
S	Concrete spall repair	SF	\$	76	\$
B	Remove existing coating system on bottom of floc/sed basins and replace with a new coating system.	SF	\$	7,200	\$
W	Remove existing coating system on walls of floc/sed basins and replace with a new coating system.	SF	\$	35	\$
F	Remove and replace existing failing repair	CF	\$	300	\$
A	Corbel repair	EA	\$	1	\$
T	Apply new coating system to the inside walls of the floc/sed basin troughs	SF	\$	4,500	\$
D	Strip rusted steel to bare metal. Clean steel in accordance with SSPC3 and paint with zinc rich primer before applying new paint system to match existing.	SF	\$	350	\$
U	Underpin the existing concrete pad to at least 2 ft below existing grade	CF	\$	100	\$
R	Existing steel beam has deteriorated at the end and needs to be replaced. Provide a new section and connections to match the existing and install to match the existing. Shore all remaining elements supported by the beam and shall be shored and reattached to the beam.	LS	\$	1	\$

Total Sum Cost, Structural Repair and Rehabilitation Work (SRF Scenario)	\$
<i>* Refer to Structural Plans and Specifications for location(s) as well as additional clarification and detail</i>	

Total Sum Cost, Alt. Bid Item #3 (SRF Scenario):

\$ _____

Total Sum Cost, Alt. Bid Item #3 (SRF Scenario) (written out in words)

Total Base Bid Cost (Sum of Base Bid Items #1, #2, and #3 Non-SRF Scenario):

\$ _____

**Total Base Bid Cost (Sum of Base Bid Items #1, #2, and #3 Non-SRF Scenario)
(written out in words)**

Total Alternate Base Bid Cost (Sum of Base Bid Items #1, #2, and #3 SRF Scenario):

\$ _____

Total Alternate Base Bid Cost (Sum of Base Bid Items #1, #2, and #3 SRF Scenario) (written out in words)

ADD ALTERNATIVE BID ITEM #4 – FORT THOMAS DIVERSION PIPING MODIFICATIONS (Non-SRF Scenario):

Add Alternative Bid Item #4: Fort Thomas Diversion Piping Modifications

Fort Thomas diversion piping modifications, which include removing existing piping, fittings, and appurtenances; furnishing and installing piping, fittings, valves with electric motor actuators, and appurtenances; and associated electrical and controls work. This work shall only be performed if accepted and authorized by the Owner.

This work will be an add alternative bid item. After evaluating the base bid items, the Owner reserves their right to accept or reject this bid item and to whether or not include this alternative as part of the Contract. If accepted, then the add alternative work will become part of the

Contract Documents. However, should the Owner not exercise its option, then the add alternative work will not be part of the Contract Documents.

Lump Sum Cost, Add Alternative Bid Item #4 (Non-SRF Scenario):

\$ _____

Lump Sum Cost, Add Alternative Bid Item #4 (Non-SRF Scenario) (written out in words)

ADD ALTERNATIVE BID ITEM #5 – FORT THOMAS DIVERSION PIPING MODIFICATIONS (SRF Scenario):

Add Alternative Bid Item #5 SRF Scenario: Fort Thomas Diversion Piping Modifications

Fort Thomas diversion piping modifications, which include removing existing piping, fittings, and appurtenances; furnishing and installing piping, fittings, valves with electric motor actuators, and appurtenances; and associated electrical and controls work. This work shall only be performed if accepted and authorized by the Owner.

This work will be an add alternative bid item. After evaluating the base bid items, the Owner reserves their right to accept or reject this bid item and to whether or not include this alternative as part of the Contract. If accepted, then the add alternative work will become part of the Contract Documents. However, should the Owner not exercise its option, then the add alternative work will not be part of the Contract Documents.

Lump Sum Cost, Add Alternative Bid Item #5 (SRF Scenario):

\$ _____

Lump Sum Cost, Add Alternative Bid Item #5 (SRF Scenario) (written out in words)

ADD ALTERNATIVE BID ITEM #6 – UV LED SYSTEM (Non-SRF Scenario):

Add Alternative Bid Item #6: UV LED System

Furnish and install an Ultraviolet (UV) LED System complete with: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV LED System with three (3) UV LED Lamp Modules, a remote HMI station, piping, fittings, and appurtenances including cooling water supply and discharge piping for each of the three UV LED Lamp Modules; and associated electrical and controls work.

Bidder will indicate the difference in cost (addition or deduction) on the Bid Disclosure Form (Section 004113) between Add Alternate Bid Item 6 (Non-SRF Scenario) and Base Bid Item 1 (Non-SRF Scenario). The Owner will determine if a medium-pressure UV system or a LED UV

system will be furnished and installed with this work using the completed Questionnaire provided in Section 004113 along with the Alternate Bid Price.

The Owner reserves their right to accept or reject this bid item and to whether or not include this alternative as part of the Contract. If accepted, then the add alternative work will become part of the Contract Documents. However, should the Owner not exercise its option, then the add alternative work will not be part of the Contract Documents.

Lump Sum Cost, Add Alternative Bid Item #6 (Non-SRF Scenario):

\$ _____

Lump Sum Cost, Add Alternative Bid Item #6 (Non-SRF Scenario) (written out in words)

ADD ALTERNATIVE BID ITEM #7 – UV LED SYSTEM (SRF Scenario):

Add Alternative Bid Item #7 SRF Scenario: UV LED System

Furnish and install an Ultraviolet (UV) LED System complete with: removing and disposing of two (2) existing UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new UV LED System with three (3) UV LED Lamp Modules, a remote HMI station, piping, fittings, and appurtenances including cooling water supply and discharge piping for each of the three UV LED Lamp Modules; and associated electrical and controls work.

Bidder will indicate the difference in cost (addition or deduction) on the Bid Disclosure Form (Section 004113) between Add Alternate Bid Item 7 (SRF Scenario) and Alternate Base Bid Item 1 (SRF Scenario). The Owner will determine if a medium-pressure UV system or a LED UV system will be furnished and installed with this work using the completed Questionnaire provided in Section 004113 along with the Alternate Bid Price.

The Owner reserves their right to accept or reject this bid item and to whether or not include this alternative as part of the Contract. If accepted, then the add alternative work will become part of the Contract Documents. However, should the Owner not exercise its option, then the add alternative work will not be part of the Contract Documents.

Lump Sum Cost, Add Alternative Bid Item #7 (SRF Scenario):

\$ _____

Lump Sum Cost, Add Alternative Bid Item #7 (SRF Scenario) (written out in words)

7. Bidder agrees that the Base Bid Work will be substantially complete as provided in paragraph 15.03 of the General Conditions within **365** days after the date when the Contract Times commence to run as provided in accordance with paragraph 4.01.A of the General Conditions, and completed and ready for final payment in accordance with

paragraph 15.06.B of the General Conditions within **395** days after the date when the Contract Times commence to run.

If Add Alternative Bid Items #4, #5, #6, and/or #7 is/are accepted and authorized by the Owner, Bidder agrees that the Alternate Bid Work will be substantially complete as provided in paragraph 15.03 of the General Conditions within **365** days after the date when the Contract Times commence to run as provided in accordance with paragraph 4.01.A of the General Conditions, and completed and ready for final payment in accordance with paragraph 15.06.B of the General Conditions within **395** days after the date when the Contract Times commence to run.

The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions. The terms in this Bid, which are defined in the General Conditions included as part of the Contract Documents, have the meanings assigned to them in the General Conditions.

8. References

	Contact Person	Company Name	Phone No.	Project Name
1.	_____	_____	_____	_____
	_____	_____	_____	_____
2.	_____	_____	_____	_____
	_____	_____	_____	_____
3.	_____	_____	_____	_____
	_____	_____	_____	_____
4.	_____	_____	_____	_____
	_____	_____	_____	_____

SUBMITTED on _____, 2025.

9. Communications concerning this Bid shall be sent to Bidder at the following address:

Phone: _____

Email: _____

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

11. Major Equipment Manufacturer's List (Part of Bid Form)

- a. Each Bidder shall enter, in the spaces provided below, the names of manufacturers of equipment which he proposes to furnish if awarded the Contract. Upon award of the Contract, the named manufacturer shall be furnished. This list is an integral part of the bid form.
- b. Not more than one manufacturer's name shall be listed for each item of equipment. If the Bidder fails to list a manufacturer's name, lists more than one manufacturer, lists a manufacturer that is not specified by name, or lists a manufacturer which is subsequently rejected during the shop drawing submittal phase, the Owner will select the equipment of his choice with no increase in Contract price. Substitutions after the bid will be permitted at the discretion of the Owner only if the named manufacturer is unable to meet the delivery requirements of the construction schedule, or the manufacturer is dilatory in complying with the requirements of the Contract Documents.
- c. Preliminary acceptance of the manufacturers named below shall not in any way constitute a waiver of the requirements of the Contract Documents covering such equipment; final acceptance will be based on full conformity with the Contract Documents.

Specification Section	Equipment/Materials	Manufacturer
113650	Filter-Aid System Feed Pumps	_____
132000	PAC Bulk Loader & Feed System	_____
137000	UV Disinfection System	_____
137000	UV System, PLC / HMI	_____ / _____
137100	UV LED Disinfection System	_____
137100	UV LED System, PLC / HMI	_____ / _____
151000	Butterfly Valves	_____
151000	Plug Valve	_____
151000	Electric Motor Actuators	_____

12. Evaluation of UV Disinfection Systems

The Owner requests supplemental information in addition to the bid costs provided above in order to further evaluate and select the preferred UV Disinfection System for this work (Medium-Pressure UV Treatment Systems and UV LED Systems).

Each Bidder shall fill in the requested information below in the spaces provided:

#	Item	Unit	MP UV System	UV LED System
12.a	Bare cost of UV System equipment and components ONLY (does not include installation or other equipment such as electrical or structural components, and does not separately consider SRF vs non-SRF costs)	Dollars		
12.b	Estimated service life of reactors	Hours		
12.c	Cost of each UV Lamp	Dollars		
12.d	# of UV Lamps required to treat 10 mgd	Each		
12.e	Normal UV Lamp Operating Life (90% effective treatment)	Hours		
12.f	Power required per UV lamp	kW		
12.g	Warm-up time	Minutes		
12.h	Estimated annual maintenance cost at 10 mgd for 6 months per year	Dollars/Year		

AUTHORIZED SIGNATURE OF BIDDER
(see signature instructions below)

Individual/Entity Name/DBA _____(print)

By: _____(sign)
(Attach evidence of authority to sign if a corporation, LLC, joint venture, or partnership)

Title: _____

Business address _____

Phone No.: _____ Fax No.: _____

Email Address for Electronic Signatures: _____

Date _____

Signatures should meet the following requirements:

- Signatures for partnerships must be made by a general partner.
- Signatures for LLCs must be made by a manager or member, as dictated by the entity's Articles of incorporation/bylaws.
- If a joint venture, each venturer must complete the above complete the above authorized signature of bidder form and attach a copy to the Bid Disclosure Form.

SUPPLEMENTS TO BID FORM

1. FORMS TO BE SUBMITTED WITH BID

- A. Bid Disclosure Form (Section 004113)
- B. Certification Regarding Debarment, Suspension and Other Responsibility Matters
- EPA Form 5700-49 (Attachment No. 9 – Section 008100)
- C. Certification Regarding Lobbying (Attachment No. 10 – Section 008100)
- D. Statement of Bidder's Qualifications (Attachment No. 1)
- E. Bidder's Experience Record (Attachment No. 2)
- F. Proposed Subcontractors (Attachment No. 3)
- G. Bid Security (Specification Section 004313)
- H. Non-Collusion Affidavit (Specification Section 004133)
- I. Required Notarized Affidavit for Bidders, Offerors, and Contractors Claiming
Kentucky Resident Bidder Status (Specification Section 004700)

2. FORMS TO BE SUBMITTED WITHIN 7 DAYS OF BID OPENING FOLLOWING
DISTRICT'S FORMAL REQUEST

Certain information and documentation is required by the funding agencies and other governing bodies prior to awarding the necessary approval for this project. The BIDDER acknowledges, through the act of submitting a Bid, a commitment to submit the following documentation or information within 7 days of Bid Opening. Failure to produce any of this documentation or information within the prescribed period will serve as grounds for rejection of the Bid. If the information is required from a subcontractor or vendor and is not produced within the prescribed time, it will serve as grounds to replace the subcontractor or vendor with another company or product.

Specific items to be submitted within 7 days of the Bid opening following the District's formal request include:

- A. Disadvantage Enterprise Participation Policy (Attachment 11 – Section 008100)
- B. List of DBE Bidders of Subcontracts (Attachment 11 – Section 008100)

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions shall be answered or the bid document will be incomplete. All data given shall be clear and comprehensive. This statement shall be notarized. If necessary, questions may be answered on separate sheets. The Bidder may submit any additional information it desires. If the Bidder is a joint venture, submit pervious joint venture projects. If joint venture has not completed prior projects of this magnitude then submit projects completed by joint venture partners.

1. Name of Bidder:
2. Permanent main office address:
3. When organized:
4. If a corporation, where incorporated:
5. How many years have you been engaged in operation of your business under your present firm or trade name:
6. Contracts on hand. (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.):
7. General character of work performed by your company:
8. Have you ever failed to complete any job awarded to you? If so, where and why?
9. Have you ever defaulted on a contract? If so, where and why?
10. List the more important projects completed by your firm, stating the approximate cost for each, and the month and year completed on attached sheet.
11. List your major equipment available for this work.
12. Experience in work similar in complexity, size and/or dollar value to this project. List and describe at least four on the table "Project References".
13. Background and experience of the principal members of your organization, including the officers in this type of work. (Attach)
14. Credit available: \$ _____
15. Give bank reference: \$ _____
16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner? ☐ Yes ☐ No

17. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information required by the Owner in verification of the statements made comprising this Statement of Bidder's Qualifications:

Dated at _____ this _____ day of _____

NAME OF BIDDER

BY _____

TITLE _____

STATE OF _____

COUNTY OF _____

_____ being duly sworn deposes and says that he or she is

_____ of _____
(NAME OF ORGANIZATION)

And that the answers to the foregoing questions and all statements contained therein are true and correct.

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

(NOTARY PUBLIC)

My commission expires _____

BIDDER'S EXPERIENCE RECORD
(Projects need to be of similar size and nature)

Change Order Value				
Contract Value				
Size of Project (Length, Contract Duration)				
Project Type, Year of Completion				
Engineer Contact Name, Telephone #				
Project Name, Owner, Address, Telephone #				

PROPOSED SUBCONTRACTORS

The BIDDER's proposed subcontractors shall be listed below for the various branches of work included in the proposed contract. All subcontractors are subject to the approval of the OWNER.

Unless rejected or otherwise permitted by the OWNER, no substitutions or changes to the listing of the entities proposed to perform that branch of the work will be allowed following opening of the Bids.

Where the BIDDER proposes to perform the work with its own forces, the phrase "Prime Contractor" shall be entered in the box provided

Failure to submit a completed list shall be cause of the rejection of the Bid.

Branch of Work	Name of Subcontractor
1. Electrical	
2. Structural	
3. Process & Mechanical	
4. Other: _____	
5. Other: _____	
6. Other: _____	
7. Other: _____	

NON-COLLUSION AFFIDAVIT

STATE OF: _____)

COUNTY OF: _____) SS

_____, being first duly sworn, deposes

and says that he/she is the _____ of
(sole owner, a partner, president, secretary, etc.)

_____, the party making the foregoing bid; that such bid is genuine and not collusive or sham; that said bidder is not financially interested in, or otherwise affiliated in a business way with any other bidder on the same contract; that said bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other person shall refrain from bidding, and has not in any manner directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the price or affidavit of any other bidder, or that of any other bidder, or to secure any advantage against Owner, or any person or persons interested in the proposed Contract; and that all statements contained in said bid are true; and further, that such bidder has not, directly or indirectly submitted this bid, or the contents thereof, or divulged information of data relative thereto to any association or to any member or agent thereof.

AFFIANT

Sworn to and subscribed before me, a Notary Public in and for the above named

State and County, this _____ day of _____, 20 _____.

Notary Public

Notary ID Number: _____

My Commission Expires: _____

End of Section

Section 00 43 13

BID BOND (PENAL SUM FORM)

Bidder Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Northern Kentucky Water District Address <i>(principal place of business)</i> : 2835 Crescent Springs Rd. Erlanger, KY 41018	Bid Project <i>(name and location)</i> : Bid Due Date:
Bond Penal Sum: Date of Bond:	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
_____ <i>(Full formal name of Bidder)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Notes: (1) Note: Addresses are to be used for giving any required notice. (2) 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 will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs 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 will 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 does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will 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 will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must 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 Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will 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 will 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 governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

(Note: The following standard form will be used for
Preparation of the agreement, after award of contract.)

Section 00 52 13

AGREEMENT
Taylor Mill Treatment Plant Upgrades and Improvements
Project No. WX21117018

THIS AGREEMENT is by and between the Northern Kentucky Water District (herein called Owner) and _____ (herein called Contractor).

Owner and Contractor, in consideration of the mutual covenants herein set forth, agree as follows:

Article 1. WORK.

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: The proposed Work is generally described as providing ultraviolet disinfection system up, powdered activated carbon (PAC) system upgrades, concrete repair, and other water treatment plant improvements.

Article 2. ENGINEER.

The Project has been designed by **Cornwell Engineering Group, Inc.** who is referred to in the Contract Documents as Engineer.

Article 3. CONTRACT TIMES, LIQUIDATED DAMAGES, DELAYS, AND DAMAGES.

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.

3.1. Contract Times. The Base Bid Work will be substantially completed within **365** days after the date when the Contract Times commence to run as provided in paragraph 4.01.A of the General Conditions, and completed and ready for final payment in accordance with paragraph 15.06.B of the General Conditions within **395** days after the date when the Contract Times commence to run.

If Add Alternative Bid Item #4 or #5 is accepted and authorized by the Owner, the Alternate Bid Work will be substantially complete as provided in paragraph 15.03 of the General Conditions within **365** days after the date when the Contract Times commence to run as provided in accordance with paragraph 4.01.A of the General Conditions, and completed and ready for final payment in accordance with paragraph 15.06.B of the General Conditions within **395** days after the date when the Contract Times commence to run.

3.2. Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article

12 of the General Conditions. The parties also recognize the delays, expenses, and difficulties involved in proving in a legal proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$ 500.00 for each day that expires after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times or any proper extension thereof granted by Owner, Contractor shall pay Owner as liquidated damages (but not as a penalty) \$ 500.00 for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment until the Work is completed and ready for final payment.

Owner shall have the right to deduct the liquidated damages from any money in its hands, otherwise due, or to become due, to Contractor, or to initiate action to recover liquidated damages for nonperformance of this Contract within the time stipulated.

3.3. Delays and Damages. In the event Contractor is delayed in the prosecution and completion of the Work because of any delays caused by Owner or Engineer, Contractor shall have no claim against Owner or Engineer for damages (including but not limited to acceleration costs or damages) or contract adjustment other than an extension of the Contract Times and the waiving of liquidated damages during the period occasioned by the delay.

Contractor shall provide advance written notice to Owner and Engineer of Contractor's intention to accelerate the Work prior to commencing any acceleration. Such written notice shall include a detailed explanation of the nature and scope of the acceleration, the reason for the acceleration, the anticipated duration of the acceleration, and the estimated additional costs to Contractor, if any, related to the acceleration. This requirement shall not in any way affect or alter the agreement of Owner and Contractor with respect to delays and damages as set forth above and in Article 7 of the General Conditions.

Article 4. CONTRACT PRICE.

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents funds a total amount of:

_____ (\$ _____)
(words) (figures)

as indicated in Contractor's bid.

Contractor acknowledges that the Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by Contractor which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. Contractor agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases under this Agreement.

Article 5. PAYMENT PROCEDURES.

Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Owner as provided in the General Conditions and as modified by the Supplementary Conditions. Contractor shall send a copy of all Applications for Payment to invoice@nkywater.org.

5.1. Progress Payments. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work. All such payments will be measured by the schedule of values or, in the event there is no schedule of values, as provided in the General Requirements.

5.2. Retainage. In addition to any amounts withheld from payment in accordance with Paragraph 15.01 of the General Conditions, Owner shall retain from progress payments amounts equal to the following percentages:

- a. Ten percent (10%) of the amount of the Work completed. This amount may be reduced by the Owner in its sole and absolute discretion, if the project is substantially completed; and
- b. Ten percent (10%) of the value of materials and equipment that are not incorporated in the Work but are delivered, suitably stored, and accompanied by documentation satisfactory to Owner as provided in paragraph 15.01 of the General Conditions. Retainage for stored materials and equipment will be released when the materials and equipment are incorporated in the Work.

All retainage will be paid to Contractor when the Work is completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions. Consent of the Surety shall be obtained before retainage is paid by Owner. Consent of the Surety, signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the Surety.

5.3. Final Payment. 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 provided in said paragraph 15.06.

Article 6. CONTRACTOR'S REPRESENTATION.

In order to induce Owner to enter into this Agreement Contractor makes the following representations:

- a. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents
- b. Contractor has visited the Site and become familiar with and is satisfied 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 federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
- d. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary explorations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by Contractor, and safety precautions and programs incident thereto.
- e. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- f. 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.
- g. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- h. Contractor has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Owner 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.

Article 7. CONTRACT DOCUMENTS.

The Contract Documents, which are incorporated as part of the Agreement, consist of the following:

- A. This Agreement;
- B. Uniform Guidance 2 CFR 200 Contract Requirements
- C. Performance Bond;
- D. Payment Bond;
- E. General Conditions;
- F. Supplementary Conditions;
- G. Specifications as listed in the table of contents of the Project Manual;
- H. Drawings consisting of a cover sheet and sheets numbered G1.0, D1.0, D2.0, P1.0, P1.0A, P2.0, P2.1, P3.0, P3.1, P4.0, P4.0A, P4.1-P4.3, M 001, M1.1, E0.1, E1.0-E1.4, E1.4A, S0.1, S1.1, S1.2, S2.1, S2.2, S5.1, S5.2, with each sheet

bearing the following general title;
Taylor Mill Treatment Plant Upgrades and Improvements
(Cover also indicates Project No. WX21117018 and an Index of Drawings for the complete set of Plans).

- I. Addenda (numbers ___ to ___, inclusive);
- J. Exhibits to this Agreement (enumerated as follows):
 - 1. Notice to Proceed;
 - 2. Contractor's Bid;
 - 3. Documentation submitted by Contractor prior to Notice of Award;
- K. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - 1. Written Amendments;
 - 2. Work Change Directives;
 - 3. Change Orders.

There are no Contract Documents other than those listed above in this Article 7. The Contract Documents may only be amended, modified, or supplemented as provided in Article 11 of the General Conditions.

Article 8. COMPLIANCE WITH KENTUCKY LAW.

Contractor represents and warrants that it has revealed to Owner any and all final determinations of a violation of KRS Chapters 136, 139, 141, 337, 338, 341, and 342 by Contractor or any subcontractor within the past five years. Contractor further represents and warrants that it and each of its subcontractors will remain in continuous compliance with the provisions of KRS Chapters 136, 139, 141, 337, 338, 341 and 342 for the duration of this Agreement. Contractor understands that its failure to reveal a final determination of a violation or to comply with the above statutory requirements constitutes grounds for cancellation of the Agreement and for disqualification of Contractor from eligibility for any contracts for a period of two years.

Article 9. EQUAL OPPORTUNITY.

Unless exempted under KRS 45.590, during the performance of the Agreement, the Contractor agrees as follows:

- a. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age forty (40) and over, disability, veteran status, or national origin;
- b. Contractor will take affirmative action in regard to employment, upgrading, demotion, transfer, recruitment, recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, so as to ensure that applicants are employed and that employees during employment are treated without regard to their race, color, religion, sex, age forty (40) and over, disability, veteran status, or national origin;

c. Contractor will state in all solicitations or advertisements for employees placed by or on behalf of Contractor that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age forty (40) or over, disability, veteran status, or national origin;

d. Contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of the nondiscrimination clauses required by this section; and

e. Contractor will send a notice to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding advising the labor union or workers' representative of Contractor's commitments under the nondiscrimination clauses.

Article 10. MISCELLANEOUS.

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

b. 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, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

c. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect of all covenants, agreements, and obligations contained in the Contract Documents.

d. 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.

Article 11. BUY AMERICA DOMESTIC PROCUREMENT PREFERENCE.

As required by Section 70914 of the Bipartisan Infrastructure Law (also known as the Infrastructure Investment and Jobs Act), P.L. 117-58, on or after May 14, 2022, none of the funds under a federal award that are part of a federal financial assistance program for infrastructure may be obligated for a project unless all of the iron, steel, manufactured products,

and construction materials used in the project are produced in the United States, unless subject to an approved waiver. The requirements of this section must be included in all subawards, including all contracts and purchase orders for work or products under this program.

Borrowers of a loan of Federal financial assistance are hereby notified that none of the funds provided under this award may be used for a project for infrastructure unless:

1. all iron and steel used in the project are produced in the United States—this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
2. all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard that meets or exceeds this standard has been established under applicable law or regulation for determining the minimum amount of domestic content of the manufactured product; and
3. all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project, but are not an integral part of the structure or permanently affixed to the infrastructure project.

For further information on the Buy America preference, please visit <https://www.epa.gov/cwsrf/build-america-buy-america-baba>. Additional information can also be found at the White House Made in America Office website: www.whitehouse.gov/omb/management/made-in-america/.

[Signature page follows.]

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. One counterpart each has been delivered to Owner, Contractor, Surety, and Engineer.

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

OWNER: **Northern Kentucky Water District**

Richard Harrison
Vice President of Engineering & Distribution

Address for giving notices

2835 Crescent Springs Road
PO Box 18640
Erlanger, Kentucky 41018

CONTRACTOR: _____

By: _____
Signature

Printed Name

Title

(Corporate Seal)

Address for giving notices

Joint Venture

CONTRACTOR:_____

By:_____ (Corporate Seal)

Address for giving notices

SECTION 00 55 00

Uniform Guidance Contract Requirements

2 CFR 200 - ARPA Funded Projects

This Agreement, Contract, or Purchase Order (“contract”) involves the use of funds from a Federal government grant. Due to the contract funding source, the following clauses from the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (“Uniform Guidance”), Appendix II are incorporated into and form a part of the terms and conditions of the contract. The full text of the Uniform Guidance may be found at 2 CFR Part 200. Contractor agrees to comply with all applicable clauses and to flow down all applicable clauses to lower-tier subcontractors. Undefined terms herein shall have the same definitions as used in the contract, or if undefined there, in 2 CFR 200.

- 1. Equal Employment Opportunity. (2 CFR 200, Appendix II (C)).** *This Section applies if the contract is a “federally assisted construction contract.”* Except as otherwise provided under 41 CFR Part 60, for all contracts that qualify as “federally assisted construction contracts” as defined in 41 CFR Part 60–1.3, contractor agrees to comply with the equal opportunity clause under 41 CFR 60-1.4(b), incorporated herein by reference, and E.O. 11246, “Equal Employment Opportunity,” as amended by E.O. 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.

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in

furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States

- 2. Contract Work Hours and Safety Standards Act (2 CFR 200, Appendix II (E); 40 U.S.C. 3701-3708).** *This section applies if the contract is in excess of \$100,000 and involves the employment of mechanics or laborers.* contractor shall comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than 1½ times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic shall

be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

3. **Clean Air Act (42 U.S.C. 7401—7671q) and the Federal Water Pollution Control Act (33 U.S.C. 1251— 1387), as amended (2 CFR 200, Appendix II (G)).** *This section applies if the contract is in excess of \$150,000.* The contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401—7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251—1387). Violations shall be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA). The contractor agrees to: i) comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq. and the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.; ii) report each violation to the Owner and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to the Treasury Department and the appropriate Environmental Protection Agency Regional Office; and iii) include these requirements in each subcontract exceeding \$100,000.
4. **Debarment and Suspension (2 CFR 200, Appendix II (H); E.O.s 12549 and 12689).** *This section applies to all federally funded contracts.* The project related to the procurement notice and/or contract is a federally funded project. In order to respond to this procurement notice, all non-federal entities, contractors, sub-recipients and sub-grantees are required to register in the System for Award Management (SAM) database. SAM is the official free, government operated website. There is NO charge to register or maintain your entity registration record in SAM. All contractors must be registered in SAM prior to receiving an award of contract from the Owner. In SAM, your company/business/organization is referred to as an “Entity”. You must register your entity to do business with the U.S. Federal government by completing the registration process in SAM. Detailed instructions for how to register your company/business/organization can be found at <https://sam.gov/content/entity-registration>. Non-federal entities are subject to the non-procurement debarment and suspension regulations implementing Executive Orders 12549 and 12689, 2 CFR part 180. These regulations restrict awards, sub-awards, and contracts with certain parties that are debarred, suspended, or otherwise Contractor must comply with 2 CFR Part 180, Subpart C and must include a requirement to comply with this regulation in any lower tier covered transaction it enters into. Contractor shall have an ongoing duty during the term of this Contract to disclose to Owner on an ongoing basis any occurrence that would prevent contractor from making the certifications contained in this section. Such disclosure shall be made in writing to Owner within five (5) business days of when contractor discovers or reasonably believes there is a likelihood of such occurrence. This certification is a material representation of fact relied upon by Owner. If it is later determined that contractor did not comply with 2 CFR Part 180, Subpart C, in addition to remedies available to Owner, the Federal government may pursue available remedies, including but not limited to suspension and/or debarment.
5. **Byrd Anti-Lobbying Amendment (2 CFR 200, Appendix II (I); 31 U.S.C. 1352).** *This section applies if the contract is for \$100,000 or more.* Contractor and its subcontractors shall file the certification required by this statute and associated regulations. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31

U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to Owner.

6. **Procurement of recovered materials (2 CFR 200.323).** *This section applies where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000.* The contractor shall comply with the requirements of Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition.
7. **Domestic preferences for procurements (2 CFR 200.322).** *This section applies to all contracts covered by 2 CFR 200.* As appropriate and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this Section must be included in all subawards including all contracts and purchase orders for work or products under this contract. For purposes of this section: i) “Produced in the United States” means, for iron and steel products, that all manufacturing processes from the initial melting stage through the application of coatings, occurred in the United States; ii) “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.
8. **Contracting with Small and Minority Businesses, Women's Business Enterprises, and Labor Surplus Area Firms (2 CFR 200.321).** *This section applies to all contracts covered by 2 CFR 200.* The contractor shall take affirmative steps to include minority businesses, women’s business enterprises, and labor surplus area firms when possible by: i) placing qualified small and minority businesses and women's business enterprises on solicitation lists; ii) assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources; iii) dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises; iv) establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; v) using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; vi) and requiring subcontractors, if subcontracts are to be let, to take the affirmative steps listed in in this Section.

CONFLICTS AMONG CLAUSES APPLICABLE TO THE CONTRACT

In the event of any conflict among the requirements of clauses applicable to contract, the most stringent requirements of the clauses will apply.

Section 00 61 00

PERFORMANCE BOND

Contractor Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Northern Kentucky Water District Mailing address <i>(principal place of business)</i> : 2835 Crescent Springs Rd. Erlanger, KY 41018	Contract Description <i>(name and location)</i> : Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: ☐ None ☐ See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

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.

1. 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.
2. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 2.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may 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 will 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 does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 2.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 2.3. 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.
3. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does 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.
4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 4.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 4.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 4.3. 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
 - 4.4. 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.
- 5. 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.
- 6. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will 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:
 - 6.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 6.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 6.3. 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.
- 7. 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.
- 8. 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 will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
- 9. 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.
- 10. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must 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 will be applicable.
- 11. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
- 12. 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 will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

13. Definitions

- 13.1. *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.
 - 13.2. *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.
 - 13.3. *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.
 - 13.4. *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.
 - 13.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
14. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
15. Modifications to this Bond are as follows: None.

Section 00 62 00

PAYMENT BOND

Contractor Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Northern Kentucky Water District Mailing address <i>(principal place of business)</i> : 2835 Crescent Springs Rd. Erlanger, KY 41018	Contract Description <i>(name and location)</i> : Contract Price: Effective Date of Contract:
Bond Bond Amount: [Amount] Date of Bond: [Date] <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: ☐ None ☐ See Paragraph 18	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

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.

1. 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.
2. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will 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.
3. 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.
4. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 4.1. Claimants who do not have a direct contract with the Contractor
 - 4.1.1. 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
 - 4.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 4.2. 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).
5. 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.
6. 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:
 - 6.1. 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
 - 6.2. Pay or arrange for payment of any undisputed amounts.
 - 6.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will 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.

7. The Surety's total obligation will 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 will be credited for any payments made in good faith by the Surety.
8. Amounts owed by the Owner to the Contractor under the Construction Contract will 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 satisfying 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.
9. 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.
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. No suit or action will 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 will be applicable.
12. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
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 will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
14. 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.
15. Definitions
 - 15.1. *Claim*—A written statement by the Claimant including at a minimum:
 - 15.1.1. The name of the Claimant;
 - 15.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

- 15.1.3. 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;
 - 15.1.4. A brief description of the labor, materials, or equipment furnished;
 - 15.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 15.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 15.1.7. The total amount of previous payments received by the Claimant; and
 - 15.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 15.2. *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 is 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.
- 15.3. *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.
- 15.4. *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.
- 15.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
16. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
17. Modifications to this Bond are as follows: None.

CERTIFICATE OF INSURANCE						Issue Date:	
PRODUCER:		THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.					
Code		COMPANIES AFFORDING COVERAGE					
Sub-Code		COMPANY LETTER A					
INSURED:		COMPANY LETTER B					
		COMPANY LETTER C					
		COMPANY LETTER D					
		COMPANY LETTER E					
COVERAGES							
THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES.							
CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE	POLICY EXPIRATION DATE	ALL LIMITS IN THOUSANDS		
	GENERAL LIABILITY				GENERAL AGGREGATE	\$1,000,	
	☒ COMMERCIAL GENERAL LIABILITY	(Completed Operations & Products Liability remains in force for 2 years after final payment)			PRODUCTS-COMP/OPS AGGREGATE	\$1,000,	
	☒ OCCURRENCE				PERSONAL & ADVERTISING INJURY	\$1,000,	
	☒ BLANKET CONTRACTUAL				EACH OCCURRENCE	\$1,000,	
	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT EACH OCCURRENCE Bodily Injury & Property Damage	\$1,000,	
	☒ ANY AUTO						
	☒ HIRED AUTOS						
	☒ NON-OWNED AUTOS						
	EXCESS LIABILITY				EACH OCCURRENCE	\$4,000,	
	☒ UMBRELLA FORM	(Follows Form of the Primary)			AGGREGATE	\$4,000,	
	WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY		
		(Includes US Longshoremen and Harbor Workers Act and Maritime Coverage Where Applicable and All States Endorsement)			EACH ACCIDENT	\$1,000,	
					DISEASE-POLICY LIMIT	\$1,000,	
					DISEASE-EACH EMPLOYEE	\$1,000,	
	OTHER				EACH OCCURRENCE		
					AGGREGATE		
DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS:							
1. Certificate Holder(s) & their Officers, Directors, Partners, Employees, & Agents Named as Additional Insured (all policies except WC). The coverage afforded the Additional Insured under these policies shall be primary insurance. If the Additional Insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. (Copy of Additional Insured Endorsement attached.) 2. Blanket Coverage for XCU Hazards (General Liability & Excess Liability). 3. Waiver of Subrogation Against Certificate Holder(s), Their Officers, Directors, Partners, Employees, & Agents (all policies). 4. Contractual Coverage covers liability assumed in the Indemnification Clause of the Contract between Certificate Holder and Insured (General Liability & Excess Liability). 5. General and Products/Completed Operations aggregates apply for each Certificate Holder contract(s) or amendments (General Liability & Excess Liability). 6. Contractual Liability Limitation Endorsement CG2139 or its equivalent is not included in either General or Excess Liability policies. 7. Severability of Interest or Cross Liability clause or endorsement included (General Liability & Excess Liability).							
CERTIFICATE HOLDERS				CANCELLATION			
1.		SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED, TERMINATED, OR MATERIALLY CHANGED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDERS NAMED TO THE LEFT. ANY IMPAIRMENT OR EXHAUSTION OF AGGREGATES WILL BE THE SUBJECT OF IMMEDIATE NOTICE TO THE CERTIFICATE HOLDERS.					
2.		AUTHORIZED REPRESENTATIVE					

CERTIFICATE OF PROPERTY INSURANCE		ISSUE DATE _____ (mm/dd/yy)
THIS IS EVIDENCE THAT INSURANCE AS IDENTIFIED BELOW HAS BEEN ISSUED IS IN FORCE AND CONVEYS ALL THE RIGHTS AND PRIVILEGES AFFORDED UNDER THE POLICY		
PRODUCER Code Sub-Code	COMPANY 	
INSURED 	POLICY NUMBER 	
	EFFECTIVE DATE (mm/dd/yy)	EXPIRATION DATE (mm/dd/yy)
PROPERTY INFORMATION		
LOCATION/DESCRIPTION 		
COVERAGE INFORMATION		
COVERAGES/PERILS/FORMS	AMOUNT OF INSURANCE	DEDUCTIBLE
BUILDERS RISK/INSTALLATION FLOATER All Risk of Physical Damage or Loss to Equipment and Materials at or incidental to the Jobsite on Completed Value Form	Insurable value of completed work. _____	
REMARKS (including Special Conditions)		
1 Certificate Holder and others identified in the property insurance paragraph of the Contract Documents are Named Insureds 2 Waiver of Subrogation against Named Insureds 3 Any similar insurance carried by Named Insureds is excess of coverage described hereon 4 Losses are payable to Owner as fiduciary for the Named Insureds		
CANCELLATION		
THIS POLICY IS SUBJECT TO THE PREMIUMS FORMS AND RULES IN EFFECT FOR EACH POLICY PERIOD SHOULD THE POLICY BE TERMINATED OR MATERIALLY CHANGED THE COMPANY WILL GIVE THE CERTIFICATE HOLDERS IDENTIFIED BELOW 30 DAYS' WRITTEN NOTICE, AND WILL SEND NOTIFICATION OF ANY CHANGES TO THE POLICY THAT WOULD AFFECT THAT INTEREST IN ACCORDANCE WITH THE POLICY PROVISIONS OR AS REQUIRED BY LAW		
CERTIFICATE HOLDERS		
Name and Address 1 2	Nature of Interest ☒ Additional Named Insured SIGNATURE OF AUTHORIZED AGENT OF THE COMPANY	

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

SECTION 00 07 00

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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 document prepared by Contractor, in a form acceptable to Engineer, to request 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; 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; 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.
- 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.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. 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), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations 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 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. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *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.
24. *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.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *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.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *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.
30. *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.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *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.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *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.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.
36. *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.
37. *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.
38. *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 or areas furnished by Owner which are designated for the use of Contractor.
39. *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.
40. *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.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *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 of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, 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.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *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.
50. *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 Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* 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:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. 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 Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means 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, means 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, means 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. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. 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 Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), 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 signed 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 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 *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 the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will 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.
 - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents 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 Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document 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 versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will 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.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will 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.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. 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.

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, means 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, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer 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 or Engineer 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 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 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 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 in writing 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.

- 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 notify Owner and Contractor in writing 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 versions, 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 precludes 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 30th 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 60th day after the day of Bid opening or the 30th 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 may 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 must 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 will 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 Contract Price or 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. Such an adjustment will 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 third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price 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. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. 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, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses 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.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing 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, or to improvements, structures, utilities, or similar facilities located at such adjacent lands 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 7.13, 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 in a court of competent jurisdiction; 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 will 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 of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

- C. *Reliance by Contractor on Technical Data:* 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 Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* 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;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. 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:
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;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 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 whether it is necessary for Owner to obtain 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; 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. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, 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 subject to the provisions of Paragraphs 4.05.D and 4.05.E.
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;
 - 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 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, then any such adjustment will 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, 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.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. 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 on the Drawings, or was not shown or indicated on the Drawings 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), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; 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
 4. 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. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, 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. 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;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will 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, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

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

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; 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 on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. 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;
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, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, 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. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- 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, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates 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 obligates 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 Contractor's obligations under the Contract. These bonds must 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 terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, 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 must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. 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.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

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. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages 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, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages 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, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. 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, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. 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.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain 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.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) 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 will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, 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 and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, 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;
 - 4. apply with respect to the performance of the Work, whether such performance is 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; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other 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 Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- 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 advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. 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 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer 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.

1. 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, risks, 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 individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater 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.
 2. None of the above waivers extends 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. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, 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, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. 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 all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights 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 insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract 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 fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 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 6.04 shall maintain such proceeds in a segregated account, and 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, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *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 maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. 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 will 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.

7.04 *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 must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will 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 must 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.

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, 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 equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) 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) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item 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 will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material 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 equipment or material under the circumstances described below. To the extent possible such requests must 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 equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.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 equipment or material that Contractor seeks to furnish or use. The application:
 - a. will 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 the item specified; and
 - 3) be suited to the same use as the item 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 the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will 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 will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers 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 or Supplier 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 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. 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 or Suppliers 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 or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, 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 or Supplier, whether initially or as a replacement, will 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 solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *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 an 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 will be disclosed 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.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. 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.

7.10 *Taxes*

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

7.11 *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. 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 is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written 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 written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *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.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. 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.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.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).
- E. 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.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that 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.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. 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.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will 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.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) 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
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must 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 Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must 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.C.
 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.C.
 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. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. 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, comply with the requirements of 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 will 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 or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 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, will 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 or Sample will 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.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

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 Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
- 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

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 is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 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. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.
- E. 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 will 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 losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage 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 will 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.

7.19 Delegation of Professional Design Services

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

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 third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. 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.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

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 for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, 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. 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 will 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, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will 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 or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- 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.
 - 1. 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 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 8.03.B.
 - 2. 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 Contractor.
- C. 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 will 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 (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 10.07. 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 *Resident 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 the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *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.

10.06 *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.

10.07 *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, will 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 Contractor under 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 10.07 also apply to the Resident Project Representative, if any.

10.08 *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 of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that 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, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in 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 11.05, (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 that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. 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 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. 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.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *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. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work 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 must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates 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.

11.06 *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.C.2.

11.07 *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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must 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);
 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 11.07.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 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will 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 will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.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 5 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 will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will 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 of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

- B. *Change Proposal Procedures*

- 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
- 2. *Supporting Data:* 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.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must 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.

- 3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must 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.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *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 in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *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 are subject 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;
 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; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- 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 rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, 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 will 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 will 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 will 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 will 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 will 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 will 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 will be incorporated in a Change Order or other written document 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. When needed 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 will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will 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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, 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, will 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will 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, which 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 will 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 or retained for services specifically related to the Work.
 5. Other costs consisting of 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, 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.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will 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 does not include any of the following items:
 - 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general 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. The cost of purchasing, renting, or furnishing small tools and hand tools.
 - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 5. 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.
 - 6. Expenses incurred in preparing and advancing Claims.
 - 7. 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*
 - 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

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 for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's 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 for Work covered by allowances, and the Contract Price will 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

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 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 with such procedures and programs 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 will 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 will 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 will 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 written 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 will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, 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 will 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 defective Work as required by Engineer, then Owner may, after 7 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 for 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.
 - 2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) 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.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. 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;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; 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 based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from 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 has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other 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; or
 - l. Other items entitle 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 will 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 will be treated as an amount due as determined by Paragraph 15.01.D.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 7 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 will 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 7 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 15.03.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 6.04 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 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must 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 duly pending Change Proposals and Claims; 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 Final Application and Recommendation of Payment:* 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 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will 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. 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. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *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 and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- 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 as a Claim, 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 Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect 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 adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, 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 from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, 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 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). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. 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.
- E. 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.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to 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 directly attributable to any such suspension. Any Change Proposal seeking such adjustments must 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) 10 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) written 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 7 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 will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 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 for any loss of anticipated profits or revenue, post-termination overhead costs, 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 7 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, 7 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, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise 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;
 - 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 requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

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 will not constitute a waiver of that provision, nor will 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 of the Contract or 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 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party 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.

18.09 *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.

18.10 *Headings*

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

SECTION 00 08 00

SUPPLEMENTARY CONDITIONS

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

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

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, "Paragraph SC-4.05."

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01. *Defined Terms*

SC-1.01. *Defined Terms.* Amend the terms as follows:

3. Application for Payment: After the word "Engineer" insert the words "and Owner".
9. Change Proposal: Strike out the following language: "contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents;"
10. Claim: Delete paragraph 1.01.10 in its entirety and insert the following in its place:

 "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; seeking resolution of a contractual issue that Owner has declined to address; or seeking other relief with respect to the terms of the Contract.
 - b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, or seeking resolution of a contractual issue that Owner has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes on final payment.
 - d. A demand for money or services by a third party is not a Claim."
11. Constituent of Concern: Insert the words "pollutants, contaminants," before the words "and any substance".
18. Drawings: Add the following new sentence to the end of the definition: "Drawings may also be described as Plans."

42. Substantial Completion: Add the following language to the end of the first sentence: "and a Certificate of Substantial Completion has been issued by the Owner."
46. Technical Data: Delete Paragraph 46.b in its entirety and insert the language "[Deleted]" in its place.

SC-1.01. *Defined Terms.* Add the following new definitions to paragraph 1.01:

- "51. *Final Completion* – The time when all work is complete, including all punch list items, and all documents required for occupancy of the facility are completed and submitted to the Owner. These documents include, but are not limited to, Certificate of Occupancy, Letters of Approval from various regulatory agencies, inspection certificates, and all other items as required in paragraph 15.06.
52. *Without exception* – The term "without exception", when used in the Contract Documents following the name of a Supplier or a proprietary item of equipment, product, or material, shall mean that the sources of the product are limited to the listed Suppliers or products and that no like, equivalent, or "or-equal" item and no substitution will be considered.
53. *Written Notice* – Notice to any party which is in writing and which shall be considered delivered and the service thereof completed once posted by certified or registered mail to the party to whom the notice is sent at its last given address or delivered in person to said party or its authorized representative on the work."

1.02. *Terminology*

SC-1.02 *Terminology.* Amend paragraph 1.02.B by inserting the language "and/or Owner" after each use of the word "Engineer".

SC-1.02. *Terminology.* Add the following paragraphs H, I, and J immediately after paragraph G:

- "H. Imperative Mood. These specifications are written to the Bidder before the award of the Contract and to the Contractor after award of the Contract. The sentences that direct the Contractor to perform work are mostly written as commands. For example, a requirement to provide cold-weather protection would be expressed as, 'Provide cold-weather protection for concrete,' rather than 'The Contractor shall provide cold-weather protection for concrete.' In the imperative mood, the subject "the Bidder" or "the Contractor" is understood.
- I. Engineer Interpretations. In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be, done, if, as, or, when, or where 'demonstrated, contemplated, required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable, unacceptable, suitable, satisfactory, unsatisfactory, sufficient, insufficient, rejected, or condemned,' it shall be understood as if the expression were followed by the words 'by the Engineer' or 'to the Engineer'.

- J. 'Shown'. When this term is used in the specifications, it means 'shown on the drawings' unless stated otherwise."

ARTICLE 2 – PRELIMINARY MATTERS

2.02. Copies of Documents

SC-2.02 *Copies of Documents*. Delete Paragraph 2.02.A. and 2.02.B. and insert the following in its place:

"Two (2) sets of contract drawings and specifications will be furnished the Contractor without charge. Additional sets will be furnished upon request at the cost of reproduction. The Contractor shall keep one (1) set of approved plans and specifications on the site of the work. This set shall be kept current by addition of all approved changes, addenda and amendments thereto. One set of as-built plans shall be returned to the Owner after the project is complete.

The plans and specifications are intended to be complementary; but should any discrepancy appear or any misunderstanding arise as to the import of anything contained in either, the decision of the District shall be final and binding on the Contractor. The Owner may make any corrections of errors or omissions in the drawings and specifications when such corrections are necessary for the proper fulfillment of their intention as construed by the Owner.

All work or materials shown on the plans and not mentioned in the specifications or any work specified and not shown on the plans, shall be furnished, performed and done by the Contractor as if the same were both mentioned in the specifications and shown on the plans.

Should the Contractor in preparing its bid find anything necessary for the work that is not mentioned in the specifications or shown on the plans, or any discrepancy, it shall notify the Owner so that such items may be included. Should the Contractor fail to notify the Owner of such items, it will be assumed that its bid included everything necessary for the complete construction in the spirit and intent of the designs shown.

In case of discrepancy, figure dimensions shall govern over scale dimensions, large-scale details shall govern over small-scale drawings, plans shall govern over specifications, detailed technical specifications shall govern over general specifications, and the more restrictive specifications shall prevail."

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

SC-3.01 *Intent*. Delete Paragraph 3.01.C in its entirety and insert the language "[Deleted]" in its place.

ARTICLE 4 - COMMENCEMENT AND PROGRESS OF THE WORK

4.01. *Commencement of Contract Times, Notice to Proceed*

SC-4.01 *Commencement of Contract Times, Notice to Proceed.* Delete the entire paragraph and insert in its place:

"A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. The date for the Contract Times may be extended by mutual written agreement between the Owner and the Contractor."

ARTICLE 5-SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.06 *Hazardous Environmental Conditions at Site*

SC-5.06 *Hazardous Environmental Conditions at Site.* Delete Paragraph 5.06.A in its entirety and replace with the following:

"A. *Reports and Drawings:* The following reports and drawings related to Hazardous Environmental Conditions identified at the Site are known to Owner: (None)."

Amend Paragraph 5.06.B by striking the following sentence:

"If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b."

Amend Paragraph 5.06.I by striking all words following the words "Hazardous Environmental Condition" in the first sentence and inserting the following language in its place at the end of the first sentence:

"created by Owner or by anyone for whom Owner is responsible, other than Contractor and all persons, subcontractors and entities for which Contractor is responsible."

ARTICLE 6 - BONDS AND INSURANCE

6.01. *Performance, Payment and Other Bonds*

SC-6.01 *Performance, Payment, and Other Bonds.* Add the following paragraphs immediately after Paragraph 6.01.A:

- "1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2018 edition).
2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2018 edition)."

Amend Paragraph 6.01.D by adding the following sentence at the end of the paragraph:

"The surety company shall be rated "A" by AM BEST."

6.02 *Insurance-General Provisions*

SC-6.02 *Insurance-General Provisions*. Amend Paragraph 6.02.D by inserting the following language after the first sentence:

“Contractor shall deliver to Owner properly completed certificates of insurance prior to the start of any Work at the Site, on the forms included in the Contract Documents or such forms as may be deemed acceptable by the Owner.”

6.03 *Contractors’ Insurance*

SC-6.03 *Contractors’ Insurance*. Add the following new Paragraphs immediately after 6.03.B.5:

- “6. cover claims arising out of pollution and excluded from the Contractor’s general liability and comprehensive automobile liability policies. This insurance shall be coordinated with the Contractor’s general liability policy and shall provide bodily injury and property damage coverage similar to the Contractor’s general liability policy. Coverage shall include contractual liability.
7. contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;
8. with respect to workers’ compensation and employers’ liability, comprehensive automobile liability, commercial general liability, and umbrella liability insurance, and all other liability insurance specified herein to be provided by Contractor, waive all of Contractor’s insurance carriers rights of subrogation against Owner, Engineer, and their respective officers, directors, partners, employees, and agents. Contractor shall require its insurance carriers to make the waivers required in this paragraph.”

Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

“D. *Workers’ Compensation and Employer’s Liability*: Contractor shall purchase and maintain workers’ compensation and employer’s liability insurance, including, as applicable, United States Longshoreman and Harbor Workers’ Compensation Act, Jones Act, stop-gap employer’s liability coverage for monopolistic states, and foreign voluntary workers’ compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers’ Compensation and Related Policies	Policy limits of not less than:
Workers’ Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman’s)	Statutory
Foreign voluntary workers’ compensation (employer’s responsibility coverage), if applicable	Statutory
Jones Act (if applicable)	
Bodily injury by accident—each accident	\$1,000,000
Bodily injury by disease—aggregate	\$1,000,000

Workers' Compensation and Related Policies	Policy limits of not less than:
Employer's Liability	
Each accident	\$1,000,000
Each employee	\$1,000,000
Policy limit	\$1,000,000

- E. *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 claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- F. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must 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, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.
 6. 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). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. 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.
- G. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
2. Any exclusion for water intrusion or water damage.
3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
4. Any exclusion of coverage relating to earth subsidence or movement.
5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
6. Any limitation or exclusion based on the nature of Contractor’s work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

H. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$1,000,000
Products—Completed Operations Aggregate	\$1,000,000
Personal and Advertising Injury	\$1,000,000
Bodily Injury and Property Damage—Each Occurrence	\$1,000,000

- I. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance 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 must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	\$1,000,000
Each Accident	\$1,000,000
Property Damage	
Each Accident	\$1,000,000
Combined Single Limit (Bodily Injury and Property Damage)	\$1,000,000

- J. *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. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	\$4,000,000
General Aggregate	\$4,000,000"

6.04 Builder's Risk and Other Property Insurance

SC-6.04 *Builder's Risk and Other Property Insurance*. Delete Paragraphs 6.04.B through 6.04.D in their entirety and insert the following in their place:

"B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Contractor shall purchase and maintain property insurance coverage upon the Work at the Site in the amount of the full replacement cost thereof. This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;
 2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, flood, damage caused by frost and freezing, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;
 3. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment accepted by Owner;
 4. include expenses incurred in the repair or replacement of any insured property (including, but not limited to, fees and charges of engineers and architects);
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer, with 30 days' written notice to each other additional insured to whom a certificate of insurance has been issued.
- C. Contractor shall be responsible for any deductible or self-insured retention.
- D. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 6.04 shall contain a provision or

endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 6.05.”

Add the following new paragraphs immediately after 6.04.E:

“F. *Builder’s Risk Requirements:* The builder’s risk insurance must:

1. be written on a builder’s risk “all risk” policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).
 - a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.
 - b. 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 will be provided through other insurance policies acceptable to Owner and Contractor.
2. 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.
3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).
4. 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).
5. extend to cover damage or loss to insured property while in transit.
6. allow for the waiver of the insurer’s subrogation rights, as set forth in this Contract.
7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.

8. include performance/hot testing and start-up, if applicable.
 9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.
 10. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds." In addition to Owner, Contractor, and Subcontractors of every tier, include as insureds the following: None.
 11. include, in addition to the Contract Price amount, the value of the following equipment and materials to be installed by the Contractor but furnished by the Owner or third parties: None.
- G. *Builder's Risk and Other Property Insurance Deductibles:* The purchaser of any required builder's risk, installation floater, or other property insurance will be responsible for costs not covered because of the application of a policy deductible."

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

7.03 Labor; Working Hours

SC-7.03 *Labor; Working Hours.* Add the following new subparagraphs immediately after Paragraph 7.03.C:

- "1. Regular working hours will be Monday through Friday 8:00 a.m. to 6:00 p.m. No Work shall be done between 6:00 p.m. and 8:00 a.m., weekends, or holidays without permission of Owner. Emergency work may be done without prior permission, however, the Contractor will need to notify the Owner as soon as practical.
2. Owner's legal holidays are New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the Friday after Thanksgiving, Christmas Eve, and Christmas Day."

Add the following new paragraphs immediately after Paragraph 7.03.C:

- "D. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.
- E. Owner is exempt from payment of sales and compensating use taxes. The Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by Contractor which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of

furnishing water or sewer services to the general public under KRS 139.480. Contractor agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases under this Agreement.

- F. It is the Contractor's responsibility to determine any applicable tax exemptions."

7.06 *Substitutes*

SC-7.06 *Substitutes*. Add the following new paragraph after paragraph 7.06.A.3.d:

- "4. If a proposed substitute item is accepted, all incidental costs associated with the use of the substitute including, but not limited to, redesign, claims of other Contractors, changes to electrical supply equipment, additional equipment or material required for the installation, etc., shall be at the expense of the Contractor proposing the substitute unless otherwise agreed to by the Owner."

7.10 *Taxes*

SC-7.10 *Taxes*. Add the following new paragraphs immediately after Paragraph 7.10.A:

- "B. Owner is exempt from payment of sales and compensating use taxes. The Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by Contractor which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. Contractor agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases under this Agreement.
- C. It is the Contractor's responsibility to determine any applicable tax exemptions."

7.15. *Emergencies*

SC-7.15 *Emergencies*. Add the following new paragraph immediately after Paragraph 7.15.A:

- "B. The Contractor understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Work Site which will allow it to respond to an emergency at the Work Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Contractor shall provide a list of emergency phone numbers for such purposes. If the Contractor does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does have such a presence, provided that any such sub-contractor must be approved by the Owner, in its sole discretion, prior to the project pre-construction meeting."

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

SC-10.03 *Resident Project Representative*. Add the following new paragraphs immediately after Paragraph 10.03.B:

- "C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor.

RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.
2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.
3. *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 Contractor's proper execution of the Work.
4. *Review of Work; Defective Work*
 - a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Observe whether any Work in place appears to be defective.
 - c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.
5. *Inspections and Tests*
 - a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.
 - b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.
6. *Payment Requests:* Review Applications for Payment with Contractor.
7. *Completion*
 - a. Participate in Engineer's visits regarding Substantial Completion.
 - b. Assist in the preparation of a punch list of items to be completed or corrected.
 - c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.
 - d. Observe whether items on the final punch list have been completed or corrected.

D. The RPR will 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 construction.
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. Authorize Owner to occupy the Project in whole or in part."

ARTICLE 11 – CHANGES TO THE CONTRACT

11.08. *Change of Contract Times*

SC-11.08 Insert the following new sentence following the first sentence of paragraph 11.08.A:
This extension shall be the Contractor's sole and exclusive remedy for such delay.

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

13.03 *Unit Price Work*

SC-13.03 *Unit Price Work.* Amend Paragraph 13.03.E.1.a by inserting the language "(more than 25%)" immediately after the language "materially and significantly".

ARTICLE 15 - PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

15.01 *Progress Payments*

SC-15.01 *Progress Payments.* Add the following new paragraphs immediately after paragraph 15.01.B.4:

- "5. Contractor's Applications for Payment shall be accompanied by the documentation specified herein.
6. Payments for stored materials and equipment shall be based only upon the actual cost to Contractor of the materials and equipment and shall not include any overhead or profit to Contractor. Partial payments will not be made for undelivered materials or equipment.
7. During the progress of the Work, each Application for Payment shall be accompanied by Contractor's updated schedule of operations, or progress report, with such shop drawings schedules, procurement schedules, value of material on hand included in application, and other data specified in Contract Documents or reasonably required by Owner."

Delete paragraphs 15.01.D in its entirety and insert the following new paragraphs in its place:

"D. Payment Becomes Due

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

15.03 Substantial Completion

SC-15.03. Add the following new paragraphs following paragraph 15.03.A:

"To be considered substantially complete, the following portions of the Work must be operational and ready for Owner's continuous use as intended: all Work required to return the tank to service including disinfection and passing required tests.

Portions of the Work not essential to operation, which can be completed without interruption of the Owner's operation, may be completed after the Work is accepted as substantially complete, and may include the following items: final cleanup and restoration such seeding and sodding."

15.06 Final Payment

SC-15.06. *Final Payment.* Add the following new sentence immediately after the last sentence in paragraph 15.06.A.2.b:

"Consent of the surety, signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the surety. The Contractor shall be responsible for providing all of the documents identified in this paragraph."

15.08 Correction Period

SC-15.08 *Correction Period.* Add the following new Paragraph 15.08.G:

"G. Nothing in Article 13 concerning the correction period shall establish a period of limitation with respect to any other obligation which Contractor has under the Contract Documents. The establishment of time periods relates only to the specific obligations of Contractor to correct the Work, and has no relationship to the time within which Contractor's obligations under the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations other than to specifically correct the Work."

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

SC-16.01. *Owner May Suspend Work.* Delete the word “shall” in the fourth line of paragraph 16.01.A and substitute the words “may therefore”.

ARTICLE 17 - FINAL RESOLUTIONS OF DISPUTES

Add the following new paragraph immediately following paragraph 17.01.

SC-17.02 *Arbitration*

“Arbitration will not be acceptable as a means for settling claims, disputes, or other matters.”

ARTICLE 18 - MISCELLANEOUS

18.06 *Survival of Obligations*

SC-18.06 *Survival of Obligations.* Add the following new paragraph immediately after paragraph 18.06.A:

“B. Contractor shall obtain from all Suppliers and manufacturers any and all warranties and guarantees of such Suppliers and manufacturers, whether or not specifically required by the Specifications, and shall assign such warranties and guarantees to Owner. With respect thereto, Contractor shall render reasonable assistance to Owner when requested, in order to enable Owner to enforce such warranties and guarantees. The assignment of any warranties or guarantees shall not affect the Correction Period or any other provisions of these Contract Documents.”

SUPPLEMENTAL GENERAL CONDITIONS

FOR

CLEAN WATER STATE REVOLVING FUND

DRINKING WATER STATE REVOLVING FUND

(Drinking Water and Wastewater)

Project Name: Taylor Mill Treatment Plant Powdered Activated Carbon System

Project Number: WX2117018

The attached instructions and regulations as listed below shall be incorporated into the Specifications and comprise Special Conditions.

	<u>Attachment No.</u>
SRF Special Provisions	1
KRS Chapter 45A Kentucky Model Procurement Code	2
Equal Employment Opportunity (EEO) Documents:	
Notice of Requirement for Affirmative Action	3
Construction Contract Specifications	4
EEO Goals for Region 4 Economic Areas	5
Check List of EEO Documentation for Bidders	6
Employer Information Report EEO-1 (SF 100)	7
Labor Standards Provisions for Federally Assisted Construction	8
Certifications:	
Debarment, Suspension and Other Responsibility Matters	9
Anti-lobbying	10
Disadvantaged Business Enterprise (DBE) Program	11
Bonds and Insurance	12
Storm Water General Permit	13
Davis-Bacon Wage Rate Requirements	14
American Iron and Steel Requirement	15
Build America Buy America Requirements	16
Prohibition on Certain Telecommunications and Video Surveillance Service Equipment or Services	17
Contractor Certificate of Compliance with Build America, Buy America Provisions for Federally Assisted Contracts (Form KIA-003)	18

SRF SPECIAL PROVISIONS

- (a) Line crossings of all roads and streets shall be done in accordance with the Kentucky Transportation Cabinet requirements as may be set forth in the Special Conditions.
- (b) Construction is to be carried out so as to prevent by-passing of flows during construction unless a schedule has been approved by the State or EPA, whichever is applicable. Siltation and soil erosion must be minimized during construction. All construction projects with surface disturbance of more than 1 acre during the period of construction must have a KPDES Storm Water General Permit. The permit can be found at this [webpage](#).

If you have any questions regarding the completion of this form call the Surface Water Permits Branch at (502) 564-3410.
- (c) Restore disturbed areas to original or better condition.
- (d) Use of Chemicals: All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either DOW or EPA. Use of all such chemicals and disposal of residues shall be in conformance with instructions on the manufacturer's label.
- (e) The construction of the project, including the letting of contracts in connection therewith, shall conform to the applicable requirements of state, territorial, and local laws and ordinances to the extent that such requirements do not conflict with Federal laws and this subchapter.
- (f) The owner shall provide and maintain competent and adequate supervision and inspection.
- (g) The Kentucky Infrastructure Authority and Kentucky Division of Water shall have access to the site and the project work at all times.
- (h) 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 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.
- (i) This procurement will be subject to DOW Procurement Guidance including the Davis-Bacon Act.
- (j) Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.
- (k) No wastewater bypassing will occur during construction unless a schedule has been approved by the Kentucky Division of Water.
- (l) Change orders to the construction contract (if required) must be negotiated pursuant to DOW/KIA Procurement Guidance for Construction and Equipment Contracts.

KRS CHAPTER 45A
KENTUCKY MODEL PROCUREMENT CODE

45A.075 Methods of awarding state contracts.

Except as otherwise authorized by law, all state contracts shall be awarded by:

- (1) Competitive sealed bidding, pursuant to KRS 45A.080; or
- (2) Competitive negotiation, pursuant to KRS 45A.085 and 45A.090 or 45A.180; or
- (3) Noncompetitive negotiation, pursuant to KRS 45A.095; or
- (4) Small purchase procedures, pursuant to KRS 45A.100.

Effective: June 24, 2003

History: Amended 2003 Ky. Acts ch. 98, sec. 4, effective June 24, 2003. -- Created 1978 Ky. Acts ch. 110, sec. 16, effective January 1, 1979.

45A.080 Competitive sealed bidding.

(1) Contracts exceeding the amount provided by KRS 45A.100 shall be awarded by competitive sealed bidding, which may include the use of a reverse auction, unless it is determined in writing that this method is not practicable. Factors to be considered in determining whether competitive sealed bidding is not practicable shall include:

- (a) Whether specifications can be prepared that permit award on the basis of best value; and
- (b) The available sources, the time and place of performance, and other relevant circumstances as are appropriate for the use of competitive sealed bidding.

(2) The invitation for bids shall state that awards shall be made on the basis of best value. In any contract which is awarded under an invitation to bid which requires delivery by a specified date and imposes a penalty for late delivery, if the delivery is late, the contractor shall be given the opportunity to present evidence that the cause of the delay was beyond his control. If it is the opinion of the purchasing officer that there is sufficient justification for delayed delivery, the purchasing officer may adjust or waive any penalty that is provided for in the contract.

(3) Adequate public notice of the invitation for bids and any reverse auction shall be given a sufficient time prior to the date set forth for the opening of bids or beginning of the reverse auction. The notice may include posting on the Internet or publication in a newspaper or newspapers of general circulation in the state as determined by the secretary of the Finance and Administration Cabinet not less than seven (7) days before the date set for the opening of the bids and any reverse auction. The provisions of this subsection shall also apply to price contracts and purchase contracts of state institutions of higher education.

(4) Bids shall be opened publicly or entered through a reverse auction at the time and place designated in the invitation for bids. At the time the bids are opened, or the reverse auction has ended, the purchasing agency shall announce the agency's engineer's estimate, if applicable, and make it a part of the agency records pertaining to the letting of any contract for which bids were received. Each written or reverse auction bid, together with the name of the bidder and the agency's engineer's estimate, shall be recorded and be open to public inspection. Electronic bid opening and posting of the required information for public viewing shall satisfy the requirements of this subsection.

(5) The contract shall be awarded by written notice to the responsive and responsible bidder whose bid offers the best value.

(6) Correction or withdrawal of written or reverse auction bids shall be allowed only to the extent permitted by regulations issued by the secretary.

Effective: July 15, 2010

History: Amended 2010 Ky. Acts ch. 63, sec. 3, effective July 15, 2010. -- Amended 2000 Ky. Acts ch. 509, sec. 1, effective July 14, 2000. -- Amended 1998 Ky. Acts ch. 120, sec. 10, effective July 15, 1998. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 27, effective May 30, 1997. -- Amended 1996 Ky. Acts ch. 60, sec. 2, effective July 15, 1996. -- Amended 1994 Ky. Acts ch. 278, sec. 1, effective July 15, 1994. -- Amended 1982 Ky. Acts ch. 282, sec. 1, effective July 15, 1982. -- Amended 1979 (1st Extra. Sess.) Ky. Acts ch. 9, sec. 1, effective February 10, 1979. -- Created 1978 Ky. Acts ch. 110, sec. 17, effective January 1, 1979.

45A.085 Competitive negotiation.

- (1) When, under administrative regulations promulgated by the secretary or under KRS 45A.180, the purchasing officer determines in writing that the use of competitive sealed bidding is not practicable, and except as provided in KRS 45A.095 and 45A.100, a contract may be awarded by competitive negotiation, which may include the use of a reverse auction.
- (2) Adequate public notice of the request for proposals and any reverse auction shall be given in the same manner and circumstances as provided in KRS 45A.080(3).
- (3) Contracts other than contracts for projects utilizing an alternative project delivery method under KRS 45A.180 may be competitively negotiated when it is determined in writing by the purchasing officer that the bids received by competitive sealed bidding either are unreasonable as to all or part of the requirements, or were not independently reached in open competition, and for which each competitive bidder has been notified of the intention to negotiate and is given reasonable opportunity to negotiate.
- (4) Contracts for projects utilizing an alternative project delivery method shall be processed in accordance with KRS 45A.180.
- (5) The request for proposals shall indicate the relative importance of price and other evaluation factors, and any reverse auction procedures.
- (6) Award shall be made to the responsible and responsive offeror whose proposal is determined in writing to be the most advantageous to the Commonwealth, taking into consideration price and the evaluation factors set forth in the request for proposals and the reciprocal preference for resident bidders required under KRS 45A.494.
- (7) Written or oral discussions shall be conducted with all responsible offerors who submit proposals determined in writing to be reasonably susceptible of being selected for award. Discussions shall not disclose any information derived from proposals submitted by competing offerors. Discussions need not be conducted:
 - (a) With respect to prices, where the prices are fixed by law, reverse auction, or administrative regulation, except that consideration shall be given to competitive terms and conditions;
 - (b) Where time of delivery or performance will not permit discussions; or
 - (c) Where it can be clearly demonstrated and documented from the existence of adequate competition or prior experience with the particular supply, service, or construction item, that acceptance of an initial offer without discussion would result in fair and reasonable best value procurement, and the request for proposals notifies all offerors of the possibility that award may be made on the basis of the initial offers.

Effective: July 15, 2010

History: Amended 2010 Ky. Acts ch. 63, sec. 4, effective July 15, 2010; and ch. 162, sec. 8, effective July 15, 2010. -- Amended 2003 Ky. Acts ch. 98, sec. 5, effective June 24, 2003. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 28, effective May 30, 1997. -- Amended 1979 (1st Extra. Sess.) Ky. Acts ch. 9, sec. 2, effective February 10, 1979. -- Created 1978 Ky. Acts ch. 110, sec. 18, effective January 1, 1979.

45A.090 Negotiation after competitive sealed bidding when all bids exceed available funds.

- (1) In the event that all bids submitted pursuant to competitive sealed bidding under KRS 45A.080 result in bid prices in excess of the funds available for the purchase, and the chief purchasing officer determines in writing:
 - (a) That there are no additional funds available from any source so as to permit an award to the responsive and responsible bidder whose bid offers the best value; and
 - (b) The best interest of the state will not permit the delay attendant to a resolicitation under revised specifications, or for revised quantities, under competitive sealed bidding as provided in KRS 45A.080, then a negotiated award may be made as set forth in subsections (2) or (3) of this section.
- (2) Where there is more than one (1) bidder, competitive negotiations pursuant to KRS 45A.085(3) shall be conducted with the three (3) (two (2) if there are only two (2)) bidders determined in writing to be the most responsive and responsible bidders, based on criteria contained in the bid invitation and the reciprocal preference for resident bidders under KRS 45A.494. Such competitive negotiations shall be conducted under the following restrictions:
 - (a) If discussions pertaining to the revision of the specifications or quantities are held with any potential offeror, all other potential offerors shall be afforded an opportunity to take part in such discussions; and

(b) A request for proposals, based upon revised specifications or quantities, shall be issued as promptly as possible, shall provide for an expeditious response to the revised requirements, and shall be awarded upon the basis of best value.

(3) Where, after competitive sealed bidding, it is determined in writing that there is only one (1) responsive and responsible bidder, a noncompetitive negotiated award may be made with such bidder in accordance with KRS 45A.095.

Effective: July 15, 2010

History: Amended 2010 Ky. Acts ch. 162, sec. 9, effective July 15, 2010. -- Amended 2003 Ky. Acts ch. 98, sec. 6, effective June 24, 2003. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 29, effective May 30, 1997. -- Created 1978 Ky. Acts ch. 110, sec. 19, effective January 1, 1979.

45A.095 Noncompetitive negotiation.

(1) A contract may be made by noncompetitive negotiation only for sole source purchases, or when competition is not feasible, as determined by the purchasing officer in writing prior to award, under administrative regulations promulgated by the secretary of the Finance and Administration Cabinet or the governing boards of universities operating under KRS Chapter 164A, or when emergency conditions exist. Sole source is a situation in which there is only one (1) known capable supplier of a commodity or service, occasioned by the unique nature of the requirement, the supplier, or market conditions. Insofar as it is practical, no less than three (3) suppliers shall be solicited to submit written or oral quotations whenever it is determined that competitive sealed bidding is not feasible. Award shall be made to the supplier offering the best value. The names of the suppliers submitting quotations and the date and amount of each quotation shall be placed in the procurement file and maintained as a public record. Competitive bids may not be required:

(a) For contractual services where no competition exists, such as telephone service, electrical energy, and other public utility services;

(b) Where rates are fixed by law or ordinance;

(c) For library books;

(d) For commercial items that are purchased for resale;

(e) For interests in real property;

(f) For visiting speakers, professors, expert witnesses, and performing artists;

(g) For personal service contracts executed pursuant to KRS 45A.690 to 45A.725; and

(h) For agricultural products in accordance with KRS 45A.645.

(2) The chief procurement officer, the head of a using agency, or a person authorized in writing as the designee of either officer may make or authorize others to make emergency procurements when an emergency condition exists.

(3) An emergency condition is a situation which creates a threat or impending threat to public health, welfare, or safety such as may arise by reason of fires, floods, tornadoes, other natural or man-caused disasters, epidemics, riots, enemy attack, sabotage, explosion, power failure, energy shortages, transportation emergencies, equipment failures, state or federal legislative mandates, or similar events. The existence of the emergency condition creates an immediate and serious need for services, construction, or items of tangible personal property that cannot be met through normal procurement methods and the lack of which would seriously threaten the functioning of government, the preservation or protection of property, or the health or safety of any person.

(4) The Finance and Administration Cabinet may negotiate directly for the purchase of contractual services, supplies, materials, or equipment in bona fide emergencies regardless of estimated costs. The existence of the emergency shall be fully explained, in writing, by the head of the agency for which the purchase is to be made. The explanation shall be approved by the secretary of the Finance and Administration Cabinet and shall include the name of the vendor receiving the contract along with any other price quotations and a written determination for selection of the vendor receiving the contract. This information shall be filed with the record of all such purchases and made available to the public. Where practical, standard specifications shall be followed in making emergency purchases. In any event, every effort should be made to effect a competitively established price for purchases made by the state.

Effective: July 15, 2002

History: Amended 2002 Ky. Acts ch. 344, sec. 9, effective July 15, 2002. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 30, effective May 30, 1997. -- Amended 1990 Ky. Acts ch. 496, sec. 4, effective July 13, 1990. -- Created 1978 Ky. Acts ch. 110, sec. 20, effective January 1, 1979

45A.100 Small purchases by state governmental bodies.

(1) Procurements may be made in accordance with small purchase administrative regulations promulgated by the secretary of the Finance and Administration Cabinet, pursuant to KRS Chapter 13A, as follows:

(a) Up to ten thousand dollars (\$10,000) per project for construction and one thousand dollars (\$1,000) for purchases by any state governmental body, except for those state administrative bodies specified in paragraph (b) of this subsection; and

(b) Up to forty thousand dollars (\$40,000) per project for construction or purchases by the Finance and Administration Cabinet, state institutions of higher education, and the legislative branch of government.

(2) Procurement requirements shall not be artificially divided so as to constitute a small purchase under this section. Reverse auctions may be used for small purchase procurements. At least every two (2) years, the secretary shall review the prevailing costs of labor and materials and may make recommendations to the next regular session of the General Assembly for the revision of the then current maximum small purchase amount as justified by intervening changes in the cost of labor and materials.

(3) The secretary of the Finance and Administration Cabinet may grant to any state agency with a justifiable need a delegation of small purchasing authority which exceeds the agency's small purchase limit provided in subsection (1) of this section. Delegations of small purchasing authority shall be granted or revoked by the secretary of the Finance and Administration Cabinet, in accordance with administrative regulations promulgated by the cabinet pursuant to KRS Chapter 13A. These administrative regulations shall establish, at a minimum, the criteria for granting and revoking delegations of small purchasing authority, including the requesting agency's past compliance with purchasing regulations, the level of training of the agency's purchasing staff, and the extent to which the agency utilizes the Kentucky Automated Purchasing System. The administrative regulations may permit the secretary of the Finance and Administration Cabinet to delegate small purchase procurements up to the maximum amount specified in subsection (1)(b) of this section.

Effective: July 15, 2010

History: Amended 2010 Ky. Acts ch. 63, sec. 5, effective July 15, 2010. -- Amended 2002 Ky. Acts ch. 320, sec. 2, effective July 15, 2002. -- Amended 2000 Ky. Acts ch. 225, sec. 1, effective July 14, 2000. -- Amended 1996 Ky. Acts ch. 60, sec. 1, effective July 15, 1996. -- Amended 1994 Ky. Acts ch. 323, sec. 1, effective July 15, 1994. -- Amended 1990 Ky. Acts ch. 496, sec. 5, effective July 13, 1990. -- Amended 1986 Ky. Acts ch. 384, sec. 1, effective July 15, 1986. -- Amended 1984 Ky. Acts ch. 384, sec. 1, effective July 13, 1984. -- Amended 1982 Ky. Acts ch. 282, sec. 2, effective July 15, 1982. -- Amended 1980 Ky. Acts ch. 242, sec. 1, effective July 15, 1980; and ch. 250, sec. 19, effective April 9, 1980. -- Created 1978 Ky. Acts ch. 110, sec. 21, effective January 1, 1979.

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO
ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)**

The following excerpts are from 45 FR 65984 (October 3, 1980):

The minority and female goals apply to Federal and federally assisted construction contractors and subcontractors which have covered contracts. The goals are expressed as a percentage of the total hours worked by such a covered or subcontractor's entire onsite construction workforce, which is working on any construction site within a relevant area. The goal applies to each construction craft and trade in the contractor's entire workforce in the relevant area including those employees working on private non-federally involved projects.

Until further notice, the following goals for minority utilization in each construction craft and trade shall be included in all Federal or federally assisted construction contracts and subcontracts in excess of \$10,000 to be performed in the respective geographic area. The goals are applicable to each nonexempt contractor's total onsite construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, federally assisted or non-federally related project, contract or subcontract.

Construction contractors which are participating in an approved Hometown Plan (see 41 CFR 60-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work, such contractors are required to comply as follows:

Goals for female participation in each trade.....6.9%
Goals for minority participation in each trade.....Insert goals for each year
(see Attachment Number 5)

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area.

The following excerpts are from 45 FR 65977 (October 3, 1980):

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation 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 the 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 the 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.

The 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 the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

As used in this Notice, and in the contract resulting from this solicitation, the covered area is (insert description of the geographical areas where the contract is to be performed giving the state, country, and city, if any).

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)**

EEO Specifications

Following is the standard language, which must be incorporated into all solicitations for offers and bids on all Federal and Federally assisted construction contracts or subcontracts in excess of \$10,000 to be performed in designated geographical areas:

1. As used in these specifications:
 - (a) Covered Area means the geographical area described in the solicitation from which this contract resulted.
 - (b) Director means Director, Office of Federal Contract Compliance Program, United States Department of Labor, or any person to whom the Director delegates authority;
 - (c) Employer identification number means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - (d) Minority includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take a good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7-a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensively as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligation.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources complied under 7-b above.

- f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, lay-off, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l. Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that EEO policy and the Contractor's obligations under these specifications are being carried out.
- n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative actions obligations (7 a through p). The efforts of a contractor association, joint contractor-union, contractor-community, of other similar group of which the contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7 a through p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be defense for the Contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example: even though the Contractor has achieved its goal for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
10. The Contractor shall not use the goals and timetables for affirmative action standards to discriminate against any person because of race, color, religion, sex or national origin.
11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation, if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

EEO GOALS FOR ECONOMIC AREAS IN REGION 4
SOURCE: APPENDIX B-80 IN 45 FR 65984 (OCTOBER 3, 1980)

Kentucky:

053 Knoxville, TN

SMSA Counties:

3840 Knoxville, TN..... 6.6
 TN Anderson; TN Blount; TN Knox; TN Union.

Non-SMSA Counties 4.5

KY Bell; KY Harlan; KY Knox; KY Laurel; KY McCreary; KY Wayne; KY
 Whitley; TN Campbell; TN Claiborne; TN Cocke; TN Cumberland; TN Fentress;
 TN Grainger, TN Hamblen; TN Jefferson; TN Loudon; TN Morgan; TN Roane;
 TN Scott; TN Sevier.

054 Nashville, TN:

SMSA Counties:

1660 Clarksville - Hopkinsville, TN - KY..... 18.2
 KY Christian; TN Montgomery.

5360 Nashville - Davidson, TN 15.8

TN Cheatham, TN Davidson; TN Dickson; TN Robertson; TN Rutherford; TN
 Sumner; TN Williamson; TN Wilson.

Non-SMSA Counties 12.0

KY Allen; KY Barren; KY Butler; KY Clinton; KY Cumberland; KY Edmonson;
 KY Logan; KY Metcalfe; KY Monroe; KY Simpson; KY Todd; KY Trigg; KY
 Warren; TN Bedford; TN Cannon; TN Clay; TN Coffee; TN DeKalb; TN Franklin;
 TN Giles; TN Hickman; TN Houston; TN Humphreys; TN Jackson; TN Lawrence;
 TN Lewis; TN Macon; TN Marshall; TN Maury; TN Moore; TN Overton; TN
 Perry; TN Pickett; TN Putnam; TN Smith; TN Stewart; TN Trousdale; TN Van
 Buren; TN Warren; TN Wayne; TN White.

56 Paducah, KY:

Non-SMSA Counties 5.2

IL Hardin; IL Massac; IL Pope; KY Ballard; KY Caldwell; KY Calloway. KY
 Carlisle; KY Crittenden; KY Fulton; KY Graves; KY Hickman; KY Livingston;
 KY Lyon. KY McCracken; KY Marshall.

57 Louisville, KY:

SMSA Counties:

4520 Louisville, KY-IN..... 11.2
 IN Clark; IN Floyd; KY Bullitt; KY Jefferson; KY Oldham.

Non-SMSA Counties 9.6

IN Crawford; IN Harrison; IN Jefferson; IN Orange; IN Scott; IN Washington; KY
 Breckinridge; KY Grayson; KY Hardin; KY Hart; KY Henry; KY Larue; KY
 Marion; KY Meade; KY Nelson; KY Shelby; KY Spencer; KY Trimble; KY
 Washington.

58	Lexington, KY	
	SMSA Counties	
	4280 Lexington-Fayette, KY	10.8
	KY Bourbon; KY Clark; KY Fayette; KY Jessamine; KY Scott; KY Woodford.	
	Non-SMSA Counties	7.0
	KY Adair KY Anderson; KY Bath; KY Boyle; KY Breathitt; KY Casey; KY Clay;	
	KY Estill; KY Franklin; KY Garrard; KY Green; KY Harrison; KY Jackson; KY	
	Knott; KY Lee; KY Leslie; KY Letcher; KY Lincoln; KY Madison; KY Magoffin;	
	KY Menifee; KY Mercer; KY Montgomery; KY Morgan. KY Nicholas; KY	
	Owsley; KY Perry; KY Powell; KY Pulaski; KY Rockcastle; KY Russell; KY	
	Taylor; KY Wolfe.	
59	Huntington, WV:	
	SMSA Counties:	
	3400 Huntington - Ashland, WV-KY-OH.....	2.9
	KY Boyd; KY Greenup; OH Lawrence; WV Cabell; WV Wayne.	
	Non-SMSA Counties	2.5
	KY Carter; KY Elliott; KY Floyd; KY Johnson; KY Lawrence; KY Martin; KY	
	Pike; KY Rowan; OH Gallia; WV Lincoln; WV Logan; WV Mason; WV Mingo.	
067	Cincinnati, OH:	
	SMSA Counties:	
	1640 Cincinnati, OH-KY-IN	11.0
	IN Dearborn; KY Boone; KY Campbell; KY Kenton; OH Clermont; OH Hamilton;	
	OH Warren.	
	3200 Hamilton - Middletown, OH.....	5.0
	OH Butler.	
	Non-SMSA Counties	9.2
	IN Franklin; IN Ohio; IN Ripley; IN Switzerland; KY Bracken; KY Carroll; KY	
	Fleming; KY Gallatin; KY Grant; KY Lewis; KY Mason; KY Owen; KY	
	Pendleton; KY Robertson; OH Adams; OH Brown; OH Clinton; OH Highland.	
080	Evansville, IN:	
	SMSA Counties	
	2440 Evansville, IN-KY	4.8
	IN Gibson; IN Posey; IN Vanderburgh; IN Warrick; KY Henderson.	
	5990 Owensboro, KY	4.7
	KY Daviess.	
	Non-SMSA Counties	3.5
	IL Edwards; IL Gallatin; IL Hamilton; IL Lawrence; IL Saline; IL Wabash; IL	
	White; IN Dubois; IN Knox; IN Perry; IN Pike; IN Spencer; KY Hancock; KY	
	Hopkins; KY McLean; KY Muhlenberg; KY Ohio; KY Union; KY Webster.	

**CHECK LIST OF EEO DOCUMENTATION FOR BIDDERS ON
GRANT/LOAN CONSTRUCTION (EXECUTIVE ORDER 11246 AS AMENDED)**

The low, responsive responsible bidder must forward the following items, in duplicate, to the owner no later than ten (10) days after bid opening. The owner shall have one (1) copy available for inspection by the Office of Federal Contracts Compliance (OFCC) within 14 days after the bid opening. More information can be found on the [OFCC](#) webpage.

1. Project Number. Project Location. Type of Construction.
2. Proof of registration with the Joint Reporting Commission. (See Attachment Number 7.)
3. Copy of Affirmative Action Plan of contractor. Indicate company official responsible for EEO.
4. List of current construction contracts, with dollar amount. List contracting Federal Agency, if applicable.
5. Statistics concerning company percent workforce, permanent and temporary, by sex, race, trade, handicapped, and age. 40 CFR Part 7.
6. List of employment sources for project in question. If union sources are utilized, indicate percentage of minority membership within the union crafts.
7. Anticipated employment needs for this project, by sex, race and trade, with estimate of minority participation in specific trades.
8. List of subcontractors (name, address and telephone) with dollar amount and duration of subcontract. Subcontractor contracts over \$10,000 must submit items 1- 7. The following information must be provided for all supplier contracts regardless of contract size: name of company, contact person, address, telephone number, dollar value of the contract, and a list of the materials to be supplied to the prime contractor.
9. List of any subcontract work yet to be committed with estimate of dollar amount and duration of contract.
10. Contract Price. Duration of prime contract.
11. DBE Documents - See special instructions regarding use of Minority, and Women Owned, and Small Businesses.

EMPLOYER INFORMATION REPORT EEO-1

Under the direction of the US Equal Employment Opportunity Commission, the Joint Reporting Committee is responsible for the full-length, multi-phase processing of employment statistics collected on the Employer Information Report EEO-1. This report, also termed Standard Form 100, details the sex and race/ethnic composition of an employer's work force by job category.

The Employer Information EEO-1 survey is conducted annually under the authority of Public Law 88-352, Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972. All employers with 15 or more employees are covered by Public Law 88-352 and are required to keep employment records as specified by Commission regulations. Based on the number of employees and federal contract activities, certain large employers are required to file an EEO-1 Report on an annual basis.

The EEO-1 Report must be filed by:

- (A) All private employers who are: (1) subject to Title VII of the Civil Rights Act of 1964 (as amended by the Equal Employment Opportunity Act of 1972) with 100 or more employees EXCLUDING State and local governments, primary and secondary school systems, institutions of higher education, Indian tribes and tax-exempt private memberships clubs other than labor organizations; OR (2) subject to Title VII who have fewer than 100 employees if the company is owned or affiliated with another company, or there is centralized ownership, control or management (such as central control of personnel policies and labor relations) so that the group legally constitutes a single enterprise and the entire enterprise employs a total of 100 or more employees.
- (B) All federal contractors (private employers), who: (1) are not exempt as provided for by 41 CFR 60-1.5, (2) have 50 or more employees, and (a) are prime contractors or first-tier subcontractors, and have a contract, subcontract, or purchase order amounting to \$50,000 or more; or (b) serve as depository of Government funds in any amount, or (c) is a financial institution which is an issuing and paying agent for U.S. Savings Bonds and Notes.

Only those establishments located in the District of Columbia and the 50 states are required to submit the EEO-1 Report. No Reports should be filed for establishments in Puerto Rico, the Virgin Islands or other American Protectorates.

When filing for the EEO-1 Report for the first time, go to the [U.S. Equal Employment Opportunity Commission](#) webpage and select "First Time Filers". Fill out the electronic questionnaire to enter your company into Joint Reporting Committee (JRC) system. Once you have completed the registration process, you will be contacted on how to proceed with the EEO-1 Report. If you have previously registered with the JRC, follow their instructions to update your information.

LABOR STANDARDS PROVISIONS FOR FEDERALLY ASSISTED CONSTRUCTION

Labor standards provisions applicable to contracts covering federally financed and assisted construction (29 CFR 5.5, Contract Provisions and Related Matters) that apply to EPA State Revolving Fund loans are:

(a)(4)(iii) *Equal employment opportunity*. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(a)(5) *Compliance with Copeland Act requirements*. The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

(a)(6) *Subcontracts*. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5 (a)(1) through (10) and such other clauses as the U.S. Environmental Protection Agency may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(a)(7) *Contract termination: debarment*. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(b) *Contractor Work Hours and Safety Standards Act*. The Administrator, EPA, shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by §5.5(a) or §4.6 of part 4 of this title. As used in this paragraph, the terms *laborers* and *mechanics* include watchmen and guards.

(b)(1) *Overtime requirements*. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(b)(2) *Violation; liability for unpaid wages; liquidated damages*. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for unliquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) *Withholding for unpaid wages and liquidated damages*. The U.S. Environmental Protection Agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime

contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in section §5.1, the Administrator of EPA shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Administrator of EPA shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the U.S. Environmental Protection Agency and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job. (Approved by the Office of Management and Budget under OMB control numbers 1215-0140 and 1215-0017.)

CERTIFICATIONS

Debarred Firms

All prime Construction Contractors shall certify that Subcontractors have not and will not be awarded to any firm that is currently on the EPA Master List of Debarred, Suspended and Voluntarily Excluded Persons in accordance with the provisions of 40 CFR 32.500(c). Debarment action is taken against a firm for noncompliance with Federal Law.

All bidders shall complete the attached certification (Attachment Number 9) and submit to the owner with the bid proposal.

Anti-lobbying Certification

All prime Construction Contractors must certify (Attachment Number 10) that no appropriated funds were or will be expended for the purpose of lobbying the Executive or Legislative Branches of the Federal Government or Federal Agency concerning this contract (contract in excess of \$100,000). If the Contractor has made or agreed to make payment to influence any member of Congress in regard to award of this contract, a Disclosure Form must be completed and submitted to the owner with the bid proposal.

All prime Contractors must require all Subcontractors to submit the certification, which must also be submitted to the owner.

**CERTIFICATION REGARDING DEBARMENT,
SUSPENSION AND OTHER RESPONSIBILITY MATTERS**

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to \$10,000 or imprisonment for up to 5 years, or both.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative

Date

_____ I am unable to certify to the above statements. My explanation is attached.

**CERTIFICATION REGARDING LOBBYING
CERTIFICATION FOR CONTRACTS,
GRANTS, LOANS, AND COOPERATIVE AGREEMENTS**

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

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients 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.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative

Date

_____ I am unable to certify to the above statements. My explanation is attached.

EPA DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

EPA's Disadvantaged Business Enterprise Program rule applies to contract procurement actions funded in part by EPA assistance agreements awarded after May 27, 2008. The rule is found at Federal regulation Title 40, Part 33. Specific responsibilities are highlighted below.

Loan recipient responsibilities:

- Include in each contract with a primary contractor the following term and condition:

 “The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract.” (*Appendix A to Part 33—Term and Condition*)
- Employ the six Good Faith Efforts during prime contractor procurement (§33.301).
- Require the prime contractor to comply with the following prime contractor requirements of Title 40 Part 33:
 - To pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient (§33.302(a)).
 - To notify recipient in writing prior to any termination of a DBE subcontractor for convenience by the prime contractor (§33.302(b)).
 - To employ the six Good Faith Efforts described in §33.301 if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason (§33.302(c)).
 - To employ the six Good Faith Efforts described in §33.301 even if the prime contractor has achieved its fair share objectives under subpart D of Part 33 (§33.302(d)).
 - To provide EPA Form 6100-2 – *DBE Program Subcontractor Participation Form* to all DBE subcontractors (§33.302(e)). **NOTE: this requirement has been suspended.**
 - To submit EPA Forms 6100-3 – *DBE Program Subcontractor Performance Form* and 6100-4 *DBE Program Subcontractor Utilization Form* as part of the bid package or proposal (§33.302(f) and (g)). **NOTE: this requirement has been suspended.**
 - To employ the six Good Faith Efforts steps in paragraphs (a) through (f) of §33.301 while procuring any subcontracts (§33.302(i)).
- Conduct an Availability Analysis and negotiate fair share objectives with EPA (§33.401), or adopt the fair share objectives of the oversight state agency revolving loan fund for comparable infrastructure (§33.405(b)(3)).
- Maintain all records documenting its compliance with the requirements of Title 40 Part 33, including documentation of its, and its prime contractors', good faith efforts (§33.501(a)).

- Create and maintain a bidders list and require the prime contractor to create and maintain a bidders list (§33.501(b)). This list must include all firms that bid or quote on prime contracts, or bid or quote subcontracts, including both MBE/WBEs and non-MBE/WBEs. This list must be kept until the project period for the identified loan has ended. The following information must be obtained from all prime and subcontractors:
 - (a) Entity's name with point of contact,
 - (b) Entity's mailing address, telephone number, and email address,
 - (c) The procurement on which the entity bid or quoted, and when, and,
 - (d) Entity's status as an MBE/WBE or non-MBE/WBE.

Prime Contractor Responsibilities:

- Include in each contract with a subcontractor the following term and condition:

“The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract.” (*Appendix A to Part 33—Term and Condition*)
- Employ the six Good Faith Efforts during subcontractor procurement (§33.301).
- Pay subcontractors for satisfactory performance no more than 30 days from receipt of payment from the recipient (§33.302(a)).
- Notify recipient in writing prior to termination of a DBE subcontractor for convenience (§33.302(b)).
- Employ the six Good Faith Efforts described in §33.301 if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason. (§33.302(c)).
- Employ the six Good Faith Efforts described in §33.301 even if the fair share objectives have been achieved under subpart D of Part 33 (§33.302(d)).
- Provide EPA Forms 6100-2 – *DBE Program Subcontractor Participation Form* and 6100-3 – *DBE Program Subcontractor Performance Form* to each DBE subcontractor prior to opening of the subcontractor's bid or proposal (§33.302(e) and (f)). **NOTE: this requirement has been suspended.**
- Complete EPA Form 6100-4 – *DBE Program Subcontractor Utilization Form* (§33.302(g)). **NOTE: this requirement has been suspended.**
- Submit to recipient with the bid package or proposal the completed EPA Form 6100-4, plus an EPA Form 6100-3 for each DBE subcontractor used in the bid or proposal (§33.302(f) and (g)). **NOTE: this requirement has been suspended.**
- Maintain all records documenting its compliance with the requirements of Title 40 Part 33, including documentation of its, and its subcontractors', good faith efforts (§33.501(a)).
- Create and maintain a bidders list and require the subcontractor to create and maintain a bidders list (§33.501(b)). This list must include all firms that bid or quote on subcontracts, including both

MBE/WBEs and non-MBE/WBEs. This list must be kept until the project period for the identified loan has ended. The following information must be obtained from all subcontractors:

- (a) Entity's name with point of contact,
- (b) Entity's mailing address, telephone number, and email address,
- (c) The procurement on which the entity bid or quoted, and when, and,
- (d) Entity's status as an MBE/WBE or non-MBE/WBE.

Subcontractor Responsibilities:

- May submit EPA Form 6100-2 – *DBE Program Subcontractor Participation Form* directly to DOW Project Manager (§33.302(e)). **NOTE: this requirement has been suspended.**
- Must complete EPA Form 6100-3 – *DBE Program Subcontractor Performance Form* and submit it to the prime contractor soliciting services prior to the prime contractor opening bids or quotes. **NOTE: this requirement has been suspended.**

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION POLICY

PROJECT NAME: _____ BID DATE: _____

1. Name, address and telephone number of contact person on all DBE matters:

Prime Contractor's Name: _____

Contact Person: _____

Address: _____

Phone: _____

Cell Phone: _____

Email: _____

Total Contract Amount: _____

2. Total dollar amount/percent of contract of MBE participation: _____

3. Total dollar amount/percent of contract of WBE participation: _____

4. Are certifications* for each MBE/WBE/DBE subcontractor enclosed; if no, please explain: _____ ☐ Yes ☐ No

5. Are MBE/WBE/DBE subcontracts or letters of intent signed by both parties enclosed; if no, please explain: _____ ☐ Yes ☐ No

6. List of MBE Subcontractors:

Name: _____

Contact Person: _____

Address: _____

Phone: _____

Cell Phone: _____

Email: _____

Type of Contract: _____

Work to be Done: _____

Amount: _____

7. List of WBE Subcontractors:

Name: _____

Contact Person: _____

Address: _____

Phone: _____

Cell Phone: _____

Email: _____

Type of Contract: _____

Work to be Done: _____

Amount: _____

Attach Additional Sheets, If Necessary

*Self-certification: Self certification of MBE/WBE/DBE firms will NOT be accepted as a valid form of certification of MBE/WBE/DBE status.

8. **Information and documentation concerning efforts taken to comply with EPA's "six good faith efforts"**

- (i). Ensure DBE construction firms or material suppliers are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities; including placing DBEs on solicitation lists and soliciting them whenever they are potential sources. A good source for a list of DBEs is the Kentucky Transportation's [Certified DBE Directory](#) webpage.

☐ The prime contractor certifies that a solicitation list of qualified DBE vendors was developed for current and future solicitations. *Submit a copy of the list as documentation.*

- (ii). Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process; including, whenever possible, posting solicitation for bids or proposals for a sufficient amount of time as to receive a competitive bid or proposal pool.

☐ The prime contractor certifies that every opportunity was provided to a number of DBEs to encourage their participation in the competitive process and that an adequate amount of time was provided for response. Must do at least one of the below.

- a. List each DBE construction firm or material supplier to which a solicitation was attempted. *Submit copies of letters, emails, faxes, telecommunication logs, certified mail receipts, returned envelopes, certified mail return receipts, etc. as documentation.*

Company name and phone number: _____

Area of work expertise: _____

Date of any follow-ups and person spoke to: _____

- b. Advertisements, if applicable: List each publication in which an announcement or notification was placed. *Submit original advertisement or a copy of the advertisement with an affidavit of publication for each announcement as documentation.*

Name of publication: _____

Date(s) of advertisement: _____

Specific subcontract areas announced: _____

- c. Other, if applicable: List each notification method in which an announcement or outreach was used; list serve, public meeting, etc. *Submit applicable information to document effort.*

Method of notification: _____

Date(s) of notification: _____

- (iii). Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs; including dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

☐ The prime contractor certifies that the project was broken into its basic elements (i.e., dirt hauling, landscaping, painting, pipe installation, material supplies, etc.) and that a determination was made whether it's economically feasible to bid the elements separately and that the analysis of this effort was documented with a short memo to the project file.

- (iv). Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises.
- ☐ The prime contractor certifies that they established delivery schedules which would allow DBEs to participate in the project and the effort was documented with a short memo to the project file.
- (v). Use the services and assistance of the Small Business Administration (SBA). The easiest way to utilize their services is to visit the [SBA](#) webpage and use the electronic tools available there or you may send the nearest SBA office a certified letter that generally describes the solicitation, the dates it will be open, the types of vendors you are seeking and applicable Standard Industrial Classification (SIC) or North American Industry Classification System (NAIC) codes if known. Or, you may use the services and assistance of the Kentucky Procurement Technical Assistance Center (PTAC) **and** the Kentucky Department of Transportation (KDOT). The easiest way to utilize the services of Kentucky PTAC and KDOT is to send an email to kyptacinfo@kstc.com and Melvin.Bynes2@ky.gov and generally describe the solicitation, the dates it will be open, the types of vendors you are seeking and applicable SIC or NAIC codes if known.
- ☐ The prime contractor certifies that the assistance of the SBA or PTAC **and** KDOT was utilized. *Submit pages printed off the SBA websites which evidence efforts to register a solicitation on the site or submit copies of the letter sent and certified mail receipt as documentation; or submit copies of emails sent to PTAC and DOT as documentation.*
- (vi). If a Prime contractor awards any subcontracts, require the subcontractor to take the steps in numbers (i) through (v) above.
- ☐ The prime contractor certifies that subcontractors used for this project will be required to follow the steps of the "six good faith efforts" as listed above.

9. Signature and date:

To the best of my knowledge and belief, all "six good faith efforts" have been met and the information contained in this document is true and correct; the document has been duly authorized by the legal representative.

Signature

Print name and title

Date

BIDDER'S LIST FORM

OWNER: _____

LOAN NO: _____

PROJECT TITLE: _____

BID DATE: _____

Instructions:

1. Per 40 CFR §33.501(b), this list must include all firms that were solicited for participation, bid on, or quoted for a prime contract or subcontract under EPA assisted projects, includes both DBE's and non DBE's.
2. SRF loan participants must keep the Bidder's List until the project period for the identified loan has ended and no funds are remaining.
3. This list must be submitted to DOW in the ATA Package. Contract Award Approval cannot be given until this form has been received by DOW.
4. The following information must be obtained from all prime and subcontractors. Please complete the form below:

ENTITY'S NAME	MAILING ADDRESS	CONTACT PERSON	PHONE#	E-MAIL ADDRESS	M/WBE?

BONDS AND INSURANCE

The minimum requirements shall be as follows:

Bonding requirements for contracts of \$100,000 or less are contained in 40 CFR 31.36(h).

Bond requirements for contracts in excess of \$100,000 are:

- Bid guarantee equivalent to five percent of the bid price. The bid guarantee shall consist of a firm commitment such as a certified check or bid bond submitted with the bid;
- Performance bond equal to 100 percent of the contract price, and
- Payment bond equal to 100 percent of the contract price. Bonds must be obtained from companies holding Certificates of Authority as acceptable sureties, issued by the U.S. Treasury.

Insurance requirements are contained in the General Conditions of the contract. In addition to the other required insurance, the owner or the contractor, as appropriate, must acquire any flood insurance made available by the Federal Emergency Management Agency as required by 44 CFR Parts 59-79, if construction will take place in a flood hazard area identified by the Federal Emergency Management Agency. The owner's requirements on Flood Insurance are contained in the Special Conditions Section of the Contracts Documents.

STORM WATER GENERAL PERMIT

All construction projects with surface disturbance of more than 1 acre during the period of construction must have a KPDES Storm Water General Permit. The permit can be found at this [webpage](#).

If you have any questions regarding the completion of this form call the Surface Water Permits Branch, at (502) 564-3410.

DAVIS-BACON WAGE RATE REQUIREMENTS

CWSRF: The recipient agrees to include in all agreements to provide assistance for the construction of treatment works carried out in whole or in part with such assistance made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.), or with such assistance made available under section 205(m) of that Act (33 U.S.C. 1285(m)), or both, a term and condition requiring compliance with the requirements of section 513 of that Act (33 U.S.C. 1372) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions. All contracts and subcontracts for the construction of treatment works carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of \$2,000 the contract clauses as set forth below titled “Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)”. This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

DWSRF: The recipient agrees to include in all agreements to provide assistance for any construction project carried out in whole or in part with such assistance made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12), a term and condition requiring compliance with the requirements of section 1450(e) of the Safe Drinking Water Act (42 U.S.C. 300j-9(e)) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions. All contracts and subcontracts for any construction project carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of \$2,000 the contract clauses as set forth below entitled “Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)”. This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

Wage Rate Requirements under the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)

Preamble

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients’ compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients’ compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

I. Requirements under the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) for Subrecipients that are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2013 Continuing Resolution with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. The recipient or subrecipient may also obtain additional guidance from [Department of Labor's](#) webpage.

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor the [General Services Administration](#) website weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor the [General Services Administration](#) website on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from the [General Services Administration](#) website into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage

determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's [General Services Administration](#) website.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the [Wage and Hour Division's](#) webpage or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under §5.5(a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5(a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman’s hourly rate) specified in the contractor’s or subcontractor’s registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice’s level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for

the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification.

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour [District Office](#).

II. Requirements under the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) for Subrecipients that are not Governmental Agencies

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY2013 Continuing Resolution with respect to subrecipients that are not governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. The recipient or subrecipient may also obtain additional guidance from [DOL's](#) webpage.

Under these terms and conditions, the subrecipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2013 Continuing Resolution, Davis-Bacon prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients must obtain proposed wage determinations for specific localities from the U.S. Department of Labor's [General Services Administration](#) website. After the Subrecipient obtains its proposed wage determination, it must submit the wage determination to (insert contact information for State recipient DB point of contact for wage determination) for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official).

(b) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor the U.S. Department of Labor's [General Services Administration](#) website on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor the U.S. Department of Labor's [General Services Administration](#) website on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from the U.S. Department of Labor's [General Services Administration](#) website into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract

or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's [General Services Administration](#) website.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the

site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the [Wage and Hour Division's](#) webpage or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5(a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5(a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and

Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act.

These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification.

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour [District Office](#) or its successor site.

AMERICAN IRON AND STEEL REQUIREMENT

The Contractor acknowledges to and for the benefit of the _____ (“Purchaser”) and the State of Kentucky (the “State”) that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as “American Iron and Steel;” that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided by the Contractor pursuant to this Agreement.

The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State.

Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser).

While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Sample Certification

The following information is provided as a sample letter of step certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name
Company Address
City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxx
2. Xxx
3. Xxx

Such process took place at the following location:

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

BUILD AMERICA BUY AMERICA REQUIREMENTS

The Contractor acknowledges to and for the benefit of the NKWD (“Owner”) and the KIA (the “Funding Authority”) that it understands the goods and services under this Agreement are being funded with federal monies and have statutory requirements commonly known as “Build America, Buy America;” that requires all of the iron and steel, manufactured products, and construction materials used in the project to be produced in the United States (“Build America, Buy America Requirements”) including iron and steel, manufactured products, and construction materials provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and Funding Authority (a) the Contractor has reviewed and understands the Build America, Buy America Requirements, (b) all of the iron and steel, manufactured products, and construction materials used in the project will be and/or have been produced in the United States in a manner that complies with the Build America, Buy America Requirements, unless a waiver of the requirements is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the Build America, Buy America Requirements, as may be requested by the Owner or the Funding Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or Funding Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). If the Contractor has no direct contractual privity with the Funding Authority, as a lender or awardee to the Owner for the funding of its project, the Owner and the Contractor agree that the Funding Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the Funding Authority.

Prohibition on Certain Telecommunications and Video Surveillance Service Equipment or Services

Prohibition on covered telecommunications and video surveillance services or equipment is effective on all obligations and expenditures of EPA financial assistance funding as of August 13, 2020, including awards made before that date.

As required by [2 CFR 200.216](#), EPA recipients and subrecipients, including borrowers under EPA-funded revolving loan fund programs, are prohibited from obligating or expending Federal loan or grant funds to procure or obtain covered telecommunications equipment or services; extend or renew a contract to procure or obtain covered telecommunications equipment or services; or enter into a contract (or extend or renew a contract) to procure or obtain covered telecommunications equipment or services. As described in section 889 of [Public Law 115-232](#), “covered telecommunications equipment or services” means any of the following:

1. Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);
2. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);
3. Telecommunications or video surveillance services provided by such entities or using such equipment;
4. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Pursuant to [2 CFR 200.216\(c\)](#), “covered telecommunications equipment or services” also include systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. Consistent with [2 CFR 200.471](#), costs incurred for telecommunications and video surveillance services or equipment such as phones, internet, video surveillance, and cloud servers are allowable except for the following circumstances:

(a) Obligating or expending EPA funds for covered telecommunications and video surveillance services or equipment or services as described in [2 CFR 200.216](#) to:

- (1) Procure or obtain, extend or renew a contract to procure or obtain;
- (2) Enter into a contract (or extend or renew a contract) to procure; or
- (3) Obtain the equipment, services, or systems.

Certain prohibited equipment, systems, or services, including equipment, systems, or services produced or provided by entities identified in section 889 of [Public Law 115-232](#), are recorded in the [System for Award Management](#) exclusion list.



**CONTRACTOR CERTIFICATE OF COMPLIANCE
WITH BUILD AMERICA, BUY AMERICA PROVISIONS
FOR FEDERALLY ASSISTED CONTRACTS**

Prime contractors and subcontractors should complete and sign a copy of this form and submit with each payment request. Prime contractors must also attach receipts and/or other documentation with this form showing evidence of BABA compliance.

CONTRACTOR NAME			
CONTRACTOR ADDRESS			
PROJECT NAME			
INVOICE PERIOD		TO	
LOAN NUMBER			
CONTRACT AMOUNT			

This certification is to be utilized by prime contractors and subcontractors who have been awarded contracts funded through KIA Federal Revolving Loan Funds and subject to the BABA provisions of the Infrastructure Investment and Jobs Act (Pub. L. No 117-27). Buy America provisions state:

- (1) All iron and steel used in the project are produced in the United States. This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
- (2) All manufactured products used in the project are produced in the United States. This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard that meets or exceeds this standard has been established under applicable law or regulation for determining the minimum amount of domestic content of the manufactured product; and
- (3) All construction materials are manufactured in the United States. This means that all manufacturing processes for the construction material occurred in the United States.

MATERIALS/MANUFACTURED GOOD(S) BEING USED FOR PROJECT (Please List)

TYPE OF GOOD	MAKE & MODEL	MANUFACTURING LOCATION

CERTIFICATE OF COMPLIANCE WITH BABA

☐ I hereby certify that all of the iron and steel, manufactured products, and construction materials supplied or provided by our company for use on this project were manufactured in the United State of America, unless an applicable waiver applies.

or

I am relying on the following BABA waiver(s) (check all that apply):

☐ De Minimis Waiver
Iron and steel, manufactured products, and construction materials supplied/provided by our company equal no more than 5 percent of the total applicable project costs of the iron and steel, manufactured products, and construction materials used in and incorporated into this project.

☐ Small Grants Waiver
The total loan amount does not exceed \$250,000.00 and is not anticipated to exceed this threshold for the life of the loan.

☐ Nonavailability Waiver
One or more iron or steel items, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality.

☐ Unreasonable Cost Waiver
The inclusion of one or more iron or steel items, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent.

☐ Adjustment Period Waiver
The project design planning was initiated prior to May 14, 2022, and the loan was obligated before November 13, 2023.

Representative Name

Title

Representative Signature

Date

SECTION 00 90 00
EMPLOYMENT REQUIREMENTS AND WAGE RATES

R-1. GENERAL. The successful bidder will be required to conform to all provisions of the federal Davis-Bacon and Related Acts (The Act) which requires that all laborers and mechanics employed by contractors and subcontractors performing on federal contracts (and contractors and subcontractors performing on federally assisted contracts under the related ACTS) in excess of \$2,000 pay their laborers and mechanics not less than the prevailing wage rates and fringe benefits, as determined by the Department of Labor, for corresponding classes of laborers and mechanics employed on similar projects in the area.

This Contract shall be based upon payment by the Contractor and his Subcontractors of wage rates not less than the prevailing hourly wage rate for each craft or type of workman engaged on the Work as determined by the Department of Labor.

The Contractor and each Subcontractor shall keep accurate records indicating the hours worked each day by each employee in each classification of work and the amount paid each employee for his work in each classification. Such records shall be open to the inspection and transcript of the Commissioner of Labor or his duly authorized representatives at any reasonable time. These payroll records shall not be destroyed or removed from the state for one year following completion of the improvement.

The Contractor and each Subcontractor shall post and keep posted in a conspicuous place or places at the construction site a copy or copies of prevailing rates of wages and working hours as prescribed in these Contract Documents.

If, during the life of this Contract, the prevailing hourly rate of wages is changed by the Department of Labor, such change shall not be the basis of any claim by the Contractor against the Owner, nor will deductions be made by the Owner against sums due the Contractor by reason of any such change.

The prevailing wage law does not prohibit payment of more than the prevailing rate of wages.

R-2. PREVAILING WAGES.

The Contractor shall note that where a contract is not awarded within 90 days from the date of establishment of the prevailing wages, there shall be a redetermination of the prevailing rate of wage before the contract is awarded.

Davis Bacon wages can be obtained from the Wage Determinations Online website. Use this link to find the Davis Bacon wages:

https://sam.gov/search/?index=dbra&sort=-modifiedDate&page=1&pageSize=25&sfm%5Bstatus%5D%5Bis_active%5D=true&sfm%5BsimpleSearch%5D%5BkeywordRadio%5D=ALL

Use the pull-down menus to enter:

- State = "Kentucky"
- County = "Kenton"
- DBA: Construction Type = "Heavy"

to find the Davis Bacon Wages.

"General Decision Number: KY20260073 05/18/2026

State: Kentucky

Construction Types: Heavy

Counties: Kentucky Counties of: Kenton

Modification Number Publication Date

0 01/02/2026

1 05/18/2026

ASBE0008-007 03/01/2025

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 35.23	\$ 23.04

ELEC0369-008 05/27/2025

	Rates	Fringes
ELECTRICIAN.....	\$ 40.96	\$ 22.44

ENGI0018-016 05/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR: BACKHOE/EXCAVATOR/TRACKHOE.....	\$ 44.14	\$ 16.41

ENGI0181-016 07/01/2025

	Rates	Fringes
POWER EQUIPMENT OPERATOR GROUP 1 DRILL; PUMPCRETE; ROLLER (BITUMINOUS) OPERATORS ON CRANES WITH BOOMS 150 FEET AND OVER (INCLUDING JIB) SHALL RECEIVE \$1.00 ABOVE GROUP 1 RATE; 250 FEET AND OVER INCLUDING JIB SHALL RECEIVE \$1.50 ABOVE CLASS 1 RATE. COMBINATION RATE: ALL CRANE OPERATORS OPERATING CRANES, WHERE THE LENGTH OF THE BOOM IN COMBINATION WITH THE LENGTH OF THE PILING LEADS EQUAL OR EXCEEDS 150 FEET, SHALL RECEIVE \$1.00 ABOVE THE GROUP 1 RATE. EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.....	\$ 41.55	\$ 19.60

POWER EQUIPMENT OPERATOR GROUP 1 Crane Forklift.....	\$ 41.55	\$ 19.60
POWER EQUIPMENT OPERATOR GROUP 1 CRANE; FORKLIFT OPERATORS ON CRANES WITH BOOM 150 FEET AND OVER, INCLUDING JIB, SHALL RECEIVE \$0.75 ABOVE GROUP 1. ALL CRANES WITH PILING LEADS WILL RECEIVE \$0.50 ABOVE GROUP 1 RATE REGARDLESS OF BOOM LENGTH. COMBINATION RATE SHALL MEAN \$0.50 PER HOUR ABOVE THE BASIC HOURLY RATE OF PAY. EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.....		
	\$ 41.55	\$ 19.60

ENGI0181-019 07/01/2025

	Rates	Fringes
POWER EQUIPMENT OPERATOR GROUP 4 PUMP; ROLLER (EARTH) OPERATORS ON CRANES WITH BOOMS 150 FEET AND OVER (INCLUDING JIB) SHALL RECEIVE \$1.00 ABOVE GROUP 1 RATE; 250 FEET AND OVER INCLUDING JIB SHALL RECEIVE \$1.50 ABOVE CLASS 1 RATE. COMBINATION RATE: ALL CRANE OPERATORS OPERATING CRANES, WHERE THE LENGTH OF THE BOOM IN COMBINATION WITH THE LENGTH OF THE PILING LEADS EQUAL OR EXCEEDS 150 FEET, SHALL RECEIVE \$1.00 ABOVE THE GROUP 1 RATE. EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.....	\$ 38.37	\$ 19.60

POWER EQUIPMENT OPERATOR GROUP 3 ARTICULATING TRUCK OPERATOR OPERATORS ON CRANES WITH BOOMS 150 FEET AND OVER (INCLUDING JIB) SHALL RECEIVE \$1.00 ABOVE GROUP 1 RATE; 250 FEET AND OVER INCLUDING JIB SHALL RECEIVE \$1.50 ABOVE CLASS 1 RATE. COMBINATION RATE: ALL CRANE OPERATORS OPERATING CRANES, WHERE THE LENGTH OF THE BOOM IN COMBINATION WITH THE LENGTH OF THE PILING LEADS EQUAL OR EXCEEDS 150 FEET, SHALL RECEIVE \$1.00 ABOVE THE GROUP 1 RATE. EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.....	\$ 39.14	\$ 19.60
POWER EQUIPMENT OPERATOR GROUP 2 BOBCAT/SKID STEER/SKID LOADER; CONCRETE PUMP; ROLLER (ROCK) OPERATORS ON CRANES WITH BOOMS 150 FEET AND OVER (INCLUDING JIB) SHALL RECEIVE \$1.00 ABOVE GROUP 1 RATE; 250 FEET AND OVER INCLUDING JIB SHALL RECEIVE \$1.50 ABOVE CLASS 1 RATE. COMBINATION RATE: ALL		

CRANE OPERATORS OPERATING CRANES, WHERE THE LENGTH OF THE BOOM IN COMBINATION WITH THE LENGTH OF THE PILING LEADS EQUAL OR EXCEEDS 150 FEET, SHALL RECEIVE \$1.00 ABOVE THE GROUP 1 RATE. EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.....			\$ 38.69	\$ 19.60
POWER EQUIPMENT OPERATOR GROUP 1 Drill; Pumpcrete; Roller (Bituminous).....			\$ 41.55	\$ 19.60
POWER EQUIPMENT OPERATOR GROUP 1 Drill Pumpcrete Roller.....			\$ 41.55	\$ 19.60
POWER EQUIPMENT OPERATOR GROUP 1 DRILL; PUMPCRETE; ROLLER (BITUMINOUS) OPERATORS ON CRANES WITH BOOMS 150 FEET AND OVER (INCLUDING JIB) SHALL RECEIVE \$1.00 ABOVE GROUP 1 RATE; 250 FEET AND OVER INCLUDING JIB SHALL RECEIVE \$1.50 ABOVE CLASS 1 RATE. COMBINATION RATE: ALL CRANE OPERATORS OPERATING CRANES, WHERE THE LENGTH OF THE BOOM IN COMBINATION WITH THE LENGTH OF THE PILING LEADS EQUAL OR EXCEEDS 150 FEET, SHALL RECEIVE \$1.00 ABOVE THE GROUP 1 RATE. EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.....			\$ 41.55	\$ 19.60
POWER EQUIPMENT OPERATOR GROUP 1 CRANE; FORKLIFT OPERATORS ON CRANES WITH BOOM 150 FEET AND OVER, INCLUDING JIB, SHALL RECEIVE \$0.75 ABOVE GROUP 1. ALL CRANES WITH PILING LEADS WILL RECEIVE \$0.50 ABOVE GROUP 1 RATE REGARDLESS OF BOOM LENGTH. COMBINATION RATE SHALL MEAN \$0.50 PER HOUR ABOVE THE BASIC HOURLY RATE OF PAY. EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10% ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.....			\$ 41.55	\$ 19.60

IRON0044-005 06/01/2025

	Rates	Fringes
IRONWORKER (STRUCTURAL AND REINFORCING).....	\$ 37.77	\$ 23.90

IRON0070-011 06/01/2025

	Rates	Fringes
IRONWORKER: ORNAMENTAL.....	\$ 36.17	\$ 25.80

LABO0189-016 07/01/2025

	Rates	Fringes
LABORER: TAMPER(HAND HELD/WALK BEHIND).....	\$ 27.12	\$19.66
LABORER: CONCRETE WORKER & GRADE CHECKER.....	\$ 26.87	\$ 19.66

LABO0265-005 05/01/2024

	Rates	Fringes
LABORER: FLAGGER & LANDSCAPE.....	\$ 35.52	\$ 14.45
LABORER: CONCRETE SAW (HAND HELD/WALK BEHIND) & PIPELAYER.....	\$ 35.69	\$ 14.45

SUKY2011-029 06/25/2014

	Rates	Fringes
TRUCK DRIVER: DUMP TRUCK.....	\$ 19.00	\$ 4.78
OPERATOR: TRENCHER.....	\$ 26.27	\$ 12.37
OPERATOR: OILER.....	\$ 24.34	\$ 13.00
OPERATOR: MECHANIC.....	\$ 28.60	\$ 11.83
OPERATOR: LOADER.....	\$ 29.37	\$ 10.13
OPERATOR: BULLDOZER.....	\$ 28.04	\$ 13.00
LABORER: CONCRETE FINISHING.....	\$ 25.75	\$ 8.60
LABORER: COMMON OR GENERAL.....	\$ 25.27	\$ 8.34
CARPENTER (FORM WORK ONLY).....	\$ 24.80	\$ 8.76

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

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

is available at
<https://www.dol.gov/agencies/whd/government-contracts>.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least \$13.65 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract from May 11, 2026, through December 31, 2026. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

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

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than "SU", "UAVG", "SA", or "SC" denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The “SU” identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

“SU” wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The “SA” identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the “SA” identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage

and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7).
Requests for review and reconsideration can be submitted via
email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the
interested party's position and any information (wage payment
data, project description, area practice material, etc.) that
the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an
interested party may appeal directly to the Administrative
Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

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SECTION 010100

SUMMARY OF WORK

PART 1 – GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. Generally, this contract includes upgrades and improvements work at the Taylor Mill Treatment Plant operated and maintained by the Northern Kentucky Water District (NKWD). A brief summary of work is provided below:
1. Chemical Building: Remove existing powdered activated carbon (PAC) storage and feed systems as well as appurtenances as indicated on the Plans. For removed equipment and components, remove existing electrical conduit and wiring back to the Electrical Room. For removed equipment and components, remove existing signal conduit and wiring back to the control panels in the Electrical Room.
 2. Chemical Building: Remove existing filter-aid storage and feed systems as well as appurtenances as indicated on the Plans. For removed equipment and components, remove existing electrical conduit and wiring back to the Electrical Room. For removed equipment and components, remove existing signal conduit and wiring back to the control panels in the Electrical Room.
 3. Main Filter Building/Tunnel Walkway: Remove the two (2) existing ultraviolet (UV) treatment systems, power supply and control panels, and appurtenances as indicated on the Plans, including the uninterrupted power supply (UPS) systems. For removed equipment and components, remove electrical conduit and wiring back to power supply and control panels, and from the panels to the power source. For removed equipment and components, remove existing conduit and wiring back to the power supply and control panels, and from the panels back to the main plant SCADA.
 4. Chemical Building: Furnish and install a new bulk PAC storage and feed system in the area designated on the Plans. The new PAC storage and feed room is to be enclosed and shall comply with applicable codes and standards. Install new electrical conduit and wiring from the Electrical Room to a new HMI Control Panel and from the panel to the new equipment and components. Install new signal conduit and wiring for new PAC control panel, and from the panel to the control panels in the Electrical Room.
 - a. Contractor shall label and tag all new conductors. Contractor shall make final terminations in the control panels in the Electrical Room and Contractor shall be responsible for programming the PAC control panel. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.

- b. Owner will update/modify the main plant SCADA for the new PAC storage and feed system.
- 5. Chemical Building: Furnish and install a new filter-aid storage and feed system in the area designated on the Plans. Install new electrical conduit and wiring from the Electrical Room to the new equipment and components. Install new signal conduit and wiring to the control panels in the Electrical Room.
 - a. Contractor shall label and tag all new conductors. Contractor shall make final terminations in the Electrical Room control panels. Contractor shall be responsible for equipment calibrations. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
 - b. Owner will update/modify the main plant SCADA for the new filter-aid storage and feed system.
- 6. Main Filter Building: Furnish and install one (1) new UV treatment system with power supply and control panels and appurtenances as indicated on the Plans. Install new electrical conduit and wiring from the control and power panel (CPP) to the new equipment and components, including a new remote HMI panel, and from the same power source as the existing to the CPP. Install new signal conduit and wiring for the new equipment and appurtenances, including a new remote HMI panel, from the basement area up to the new CPP in the first-floor break room, and from the CPP up to the main plant SCADA on the second floor.
 - a. Contractor shall label and tag all new conductors. Contractor shall make final terminations at the main plant SCADA. Contractor shall be responsible for all programming associated with the CPP/HMI. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
 - b. Owner will update/modify the main plant SCADA for the new UV treatment system.
- 7. Flocculation-Sedimentation Basins: Perform rehabilitation and repair work as indicated on the Plans, particularly the Structural Plans. Work to be performed includes, but is not limited to:
 - a. Concrete spall and crack repair,
 - b. Rebar repair;
 - c. Corbel repair;
 - d. Coating repair/replacement; and
 - e. Steel restoration and protection.
- 8. Main Filter Building, Add Alternative Bid Item: If authorized by Owner, furnish and install piping, valves, and appurtenances for the Fort Thomas diversion line as indicated on the Plans. Install new electrical conduit and wiring from the new valve actuators to the power source identified on the Plans. Install new signal conduit from valve actuators (basement) up to the main plant SCADA (second floor), including making final terminations in panel(s).

- a. *This work will be an add alternate bid item. After evaluating the base bid items, the Owner reserves their right to accept or reject the add alternative bid item and to whether or not include this work as part of the Contract. If accepted, then the add alternative work will become part of the Contract Documents. However, should the Owner not exercise its option, then the add alternative work will not be part of the Contract Documents.*
 - b. *Contractor shall label and tag all new conductors.*
 - c. *Contractor shall make final terminations at the main plant SCADA.*
 - d. *Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.*
 - e. *Owner will update/modify the main plant SCADA for the Fort Thomas diversion piping modifications.*
- 9. Main Filter Building, Add Alternative Bid Item: If authorized by the Owner, furnish and install one (1) new UV LED System as shown and specified.
 - a. This work will be an add alternate bid item. Prospective bidders shall provide a bid cost for the work required for the UV LED System. After evaluating the base bid items, the Owner reserves their right to accept or reject the add alternative bid item and to whether or not include this work as part of the Contract. If accepted, then the add alternative work will become part of the Contract Documents. However, should the Owner not exercise its option, then the add alternative work will not be part of the Contract Documents.
 - b. Contractor shall label and tag all new conductors. Contractor shall make final terminations at the Main Plant SCADA. Contractor shall be responsible for all programming associated with the UV LED Lamp Modules and Remote HMI Station. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
 - c. Owner will update/modify the Main Plant SCADA for the new UV LED System.
- 10. The Contractor shall be responsible for obtaining and paying for permits and related fees.
 - a. NKWD will make on-site utilities available to the Contractor for the entirety of the construction period.
 - b. The Contractor shall be prepared to modify existing or install new facilities in order to comply with the required permits, the Contract Documents, or applicable codes and standards.
- B. The Taylor Mill Treatment Plant is located at 608 Grand Avenue, Taylor Mill, Kentucky 41015.
- C. The summary of the Work as described in this Section is an overall general summary of the responsibilities of each contractor and its relationship with the

Owner. However, it does not supersede the specific requirements of the entire Contract Documents.

- D. The Contractor shall be responsible for furnishing all labor, material, tools, equipment, and appurtenances and services required for construction in accordance with the Contract Documents. Bids shall also include, but not limited to, mobilization, demobilization, administrative labor, materials, transportation, taxes, insurance, and all other items necessary to successfully complete the Work, including required testing prior to, during and after construction activities are complete in order to successfully close-out applicable permits.
- E. All work described in the Contract Documents shall be the responsibility of the Contractor to furnish and install unless specifically noted as “Owner supplied” or “Owner installed”.
- F. Owner Supplied Control System Programmer: HDR will be retained by the Owner outside of this construction contract as the Control System Programmer. The Control System Programmer will be responsible for the development of PLC logic and InTouch HMI application development, including
 1. Modifications to existing plantwide InTouch application and configuration to accommodate new ControlLogix PLC (tag database updates).
 2. Participation in witnessed field demonstrations by Contractor-supplied control systems.
 3. Deployment and testing of developed PLC program and InTouch application.
 4. Training of control system software functions (Plant Operator and I&C Technician).

1.2 WORK REQUIREMENTS

- A. All Work shall be completed in accordance with the Contract Documents.
- B. Proposed construction work shall not impact the water treatment facility from remaining in operation at all times, including maintenance requirements and deliveries.
- C. Work activities shall be scheduled to accommodate Owner use of premises during construction. Coordinate Progress Schedule with Owner occupancy during construction.
- D. Contractor shall submit a detailed work sequence and schedule for approval by the Owner and the Engineer at least two weeks prior to the commencement of Work. A detailed construction schedule shall be submitted in accordance with Contract Documents, and shall be updated during construction and included with payment application requests.

- E. Contractor shall request any necessary shutdowns and/or lockouts in writing to the Engineer and Owner at least seven (7) days in advance. As a minimum, the request should indicate the work to be performed during the shutdown, the areas of the plant impacted, what time the shutdown would begin, and the estimated duration of the shutdown. Only the Owner's plant staff shall perform any required valve operations, shutdowns, or lockout operations.

1.3 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Site Administration: The Contractor shall be responsible for all areas of the Site used by themselves and their subcontractors in the performance of the Work. They shall exert full preservation of property and existing facilities, except such controls as may be reserved to the Owner or others. The Contractor shall require all persons under their authority at the site to observe the same rules as they require of their employees and representatives. The Owner's employees or authorized representatives will not be subject to the provisions of this paragraph.
- B. Contractor shall be prepared to utilize designated areas on-site as well as other areas as permitted by the Owner.
- C. Contractor shall propose a Monday through Friday work schedule acceptable to the Owner.
 - 1. Unless approved by the Owner ahead of time, working outside of the agreed upon work schedule, weekends or holidays shall not be permitted.
 - 2. Owner will advise in as far in advance as possible of scheduled holidays or other dates/times when work will not be allowed.
- D. Site Access: Select personnel will be identified by the Contractor that will be provided with security cards for access to the site.
- E. Coordinate use of premises under direction of the Owner's plant staff. Contractor shall limit use of premises for Work, for storage, and for access, to allow:
 - 1. Owner occupancy and normal operations.
 - 2. Separate work by other contractors.
 - 3. Routing deliveries of chemicals, fuel and others by the Owner.
- G. Contractor shall assume full responsibility for protection and safekeeping of equipment and materials under this Contract.
- H. Contractor shall be prepared to obtain and pay for storage trailers or containers for equipment and materials required under this Work. Contractor will not assume Owner will allow for temporary storage within the treatment facilities or other areas not designated and approved for Contractor staging and storage. This will be discussed with the selected Contractor at the Pre-Construction Conference.

- I. Contractor shall be responsible for repairing or restoring damaged areas as a result of completing the work by their personnel or their subcontractors.

1.4 SITE SAFETY

- A. The Contractor shall be required to develop a site specific safety plan meeting all applicable Federal, State, and local safety standards. A generic safety plan (i.e., Contractor's general safety procedures) will not be acceptable.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 010170

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Contractor shall furnish all labor, materials, tools, equipment, appurtenances, incidentals, and all services necessary to perform all work required for the items listed herein.
- B. The items listed below, beginning with Article 1.3, refer to and are the same pay items listed in the Bid Form. They constitute all of the pay items for the completion of the Work.
- C. No direct or separate payment will be made for providing miscellaneous, temporary, or accessory works, services, surveying, job signs, sanitary requirements, testing, safety devices, approval and record drawings, water supplies, power, removal of waste, watchmen, bonds, insurance, and all other requirements of the General Conditions, Supplementary Conditions, and General Requirements.
- D. Compensation for all such services, things, and materials shall be included in the prices stipulated for the items listed herein.
- E. In Section 004113, Bidder shall provide bid costs (in words and numerically) for the bid items that do not have to comply with SRF requirements (Non-SRF) and for those that do have to comply with SRF requirements (SRF alternative bid items). Owner will have the discretion to select either Non-SRF or SRF alternative bid items. Bid costs selected by Owner will be either all Non-SRF or all SRF alternative bid items. SRF alternative bid items shall conform to the requirements as described herein and in other related sections of the Contract Documents.
 - 1. For the SRF alternate bid items, SRF requirements (including American Iron and Steel and Davis Bacon) and provisions must be met by the Bidder and all subcontractors. SRF requires federal prevailing wage rates to be paid to all employees of the Bidder and all employees of any subcontractor.
 - 2. For the SRF alternate bid items, all Bidders must comply with the President's Executive Order No. 11246 (Equal Employment Opportunity) as amended, which prohibits discrimination in employment regarding race, creed, color, sex, or national origin.
 - 3. For the SRF alternate bid items, all Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours Standard Act.
 - 4. For the SRF alternate bid items, all Bidders, Contractors and Subcontractors must comply with 41 CFR 60-4, in regard to Affirmative Action, to ensure equal opportunity to females and minorities and will apply the timetables and goals set forth in 41 CFR 60-4.

5. For the SRF alternate bid items, Bidders must make positive efforts to use small, minority, women-owned and disadvantaged businesses.
6. For the SRF alternate bid items, all Bidders must comply with OSHA (P.L. 91-596) and the Contract Work Hours and Safety Standards Act (P.L. 91-54).
7. For the SRF alternate bid items, the Successful Bidder and all Subcontractors will be required to conform to the labor standards set forth in the Contract Documents. This procurement is subject to Kentucky Division of Water Procurement Guidance including the Davis-Bacon Act.
8. For the SRF alternate bid items, the Successful Bidder shall also be required to furnish and install a physical project (72 in (W) x 48 in (H)) sign displaying the EPA emblem and identifying the project as a “project funded by U.S. Environmental Protection Agency.” See https://www.epa.gov/sites/default/files/201607/documents/guidelines_for_enhancing_public_awareness_srf.pdf for guidance. A copy of the guidance document is provided at the end of Section 015000.

1.2 RELATED PROVISIONS SPECIFIED ELSEWHERE

- A. Payments to Contractor: General and Supplementary Conditions, including Supplemental Conditions SRF
- B. Changes in Contract Price: General and Supplementary Conditions, including Supplemental Conditions SRF
- C. Section 013700 - Schedule of Values

1.3 BID PACKAGE

- A. Base Bid Item #1 – UV Treatment System Upgrades and Improvements (Non-SRF Scenario):
 1. Measurement: Ultraviolet (UV) disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing in-line UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new in-line UV treatment system, power supply and control panels, a new remote HMI panel, piping, fittings, and appurtenances; and associated electrical and controls work.
 - a. Install new electrical conduit and wiring from the control and power panel (CPP) to the new equipment and components, including the new remote HMI panel.
 - b. Install new signal conduit and wiring for the new UV equipment and appurtenances, including the new remote HMI panel, in the basement area up to the first-floor break room where the new CPP will be located, and a new CAT6 ethernet cable from the CPP up to the main plant SCADA on the second floor.
 - 1) Contractor shall label and tag all new conductors. Contractor shall be responsible for all programming associated with the CPP/HMI. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.

- 2) Owner will update/modify the main plant SCADA for the new UV treatment system.
 2. Payment: The work specified under this Section shall be paid for at the contract lump sum price for Base Bid Item #1. Payments shall be in accordance with Contract Documents.
- B. Alternate Base Bid Item #1 – UV Treatment System Upgrades and Improvements (SRF Scenario):
1. Measurement: Ultraviolet (UV) disinfection system upgrades and improvements work, including: removing and disposing of two (2) existing in-line UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new in-line UV treatment system, power supply and control panels, a new remote HMI panel, piping, fittings, and appurtenances; and associated electrical and controls work.
 - a. Install new electrical conduit and wiring from the control and power panel (CPP) to the new equipment and components, including the new remote HMI panel.
 - b. Install new signal conduit and wiring for the new UV equipment and appurtenances, including the new remote HMI panel, in the basement area up to the first-floor break room where the new CPP will be located, and a new CAT6 ethernet cable from the CPP up to the main plant SCADA on the second floor.
 - 1) Contractor shall label and tag all new conductors. Contractor shall be responsible for all programming associated with the CPP/HMI. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
 - 2) Owner will update/modify the main plant SCADA for the new UV treatment system.
 2. Payment: The work specified under this Section shall be paid for at the contract lump sum price for Alternate Base Bid Item #1. Payments shall be in accordance with Contract Documents.
- C. Base Bid Item #2 – PAC Storage and Feed System Upgrades and Improvements (Non-SRF Scenario):
1. Measurement: PAC system upgrades and improvements work, including: removing and disposing of existing PAC systems and Filter-Aid systems; furnishing and installing new PAC systems and Filter-Aid systems; constructing an enclosed area within an existing facility for the PAC systems; and associated structural, mechanical, and electrical/controls work.
 - a. For the new PAC system, install new electrical conduit and wiring from the Electrical Room to the new Control Panel and from the panel to the new equipment and components. Install new signal conduit and wiring for new PAC control panel, and from the panel to the control panels in the Electrical Room.
 - b. For the new Filter-Aid system, install new electrical conduit and wiring from the Electrical Room to the new equipment and components. Install new signal conduit and wiring to the control panels in the Electrical Room.
 - c. For signal related work,

- 1) Contractor shall label and tag all new conductors. Contractor shall be responsible for all programming between the PAC control panel and the PAC system equipment and components; install new signal conduit and wiring for the new equipment and appurtenances to the Electrical Room control panels; make final in Electrical Room control panels; and prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor; and
 - 2) Owner will update/modify the main plant SCADA for the new Filter-Aid and PAC storage and feed systems.
2. Payment: The work specified under this Section shall be paid for at the contract lump sum price for Base Bid Item #2. Payments shall be in accordance with Contract Documents.

D. Alternate Base Bid Item #2 – PAC Storage and Feed System Upgrades and Improvements (SRF Scenario):

1. Measurement: PAC system upgrades and improvements work, including: removing and disposing of existing PAC systems and Filter-Aid systems; furnishing and installing new PAC systems and Filter-Aid systems; constructing an enclosed area within an existing facility for the PAC systems; and associated structural, mechanical, and electrical/controls work.
 - a. For the new PAC system, install new electrical conduit and wiring from the Electrical Room to the new Control Panel and from the panel to the new equipment and components. Install new signal conduit and wiring for new PAC control panel, and from the panel to the control panels in the Electrical Room.
 - b. For the new Filter-Aid system, install new electrical conduit and wiring from the Electrical Room to the new equipment and components. Install new signal conduit and wiring to the control panels in the Electrical Room.
 - c. For signal related work,
 - 1) Contractor shall label and tag all new conductors. Contractor shall be responsible for all programming between the PAC control panel and the PAC system equipment and components; install new signal conduit and wiring for the new equipment and appurtenances to the Electrical Room control panels; make final in Electrical Room control panels; and prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor; and
 - 2) Owner will update/modify the main plant SCADA for the new Filter-Aid and PAC storage and feed systems.
2. Payment: The work specified under this Section shall be paid for at the contract lump sum price for Alternate Base Bid Item #2. Payments shall be in accordance with Contract Documents.

E. Base Bid Item #3 – Flocculation and Sedimentation Basins Structural Rehabilitation (Non-SRF Scenario):

1. Measurement: As seen in the Repair Schedule below, this item includes all structural repair and rehabilitation work for the interior and exposed exterior

surfaces of the flocculation and sedimentation basins as well as inside the below-grade walkway tunnel. Refer to Structural Plans and Specifications for additional information and details.

REPAIR SCHEDULE (Non-SRF Scenario)					
Repair*	Type	Units	Unit Cost	Estimated Quantity	Total Cost
G	Gravity feed epoxy	LF	\$	350	\$
P	Epoxy injection	LF	\$	100	\$
C	Expansion joint crack repair	LF	\$	245	\$
E	Exposed rebar	LF	\$	16	\$
S	Concrete spall repair	SF	\$	-	\$
B	Remove existing coating system on bottom of floc/sed basins and replace with a new coating system.	SF	\$	7,200	\$
W	Remove existing coating system on walls of floc/sed basins and replace with a new coating system.	SF	\$	35	\$
F	Remove and replace existing failing repair	CF	\$	300	\$
A	Corbel repair	EA	\$	1	\$
T	Apply new coating system to the inside walls of the floc/sed basin troughs	SF	\$	4,500	\$
D	Strip rusted steel to bare metal. Clean steel in accordance with SSPC3 and paint with zinc rich primer before applying new paint system to match existing.	SF	\$	350	\$
U	Underpin the existing concrete pad to at least 2 ft below existing grade	CF	\$	100	\$
R	Existing steel beam has deteriorated at the end and needs to be replaced. Provide a new section and connections to match the existing and install to match the existing. Shore all remaining elements	LS	\$	1	\$

	supported by the beam and shall be shored and reattached to the beam.				
Total Cost, Structural Repair and Rehabilitation Work (Non-SRF Scenario)				\$	
<i>* Refer to Structural Plans and Specifications for location(s) as well as additional clarification and detail</i>					

2. Payment: For Base Bid #3 (Non-SRF Scenario), payments for the work specified under this Section shall be paid for at the unit price indicated and for the estimated quantities indicated above. Compensation will be in accordance with Contract Documents for the actual quantities repaired at the unit price indicated on the Bid Form.
 - a. Quantities not used shall be credited back to the Owner at the same unit cost shown in the Bid Form.
 - b. Quantities repaired in excess of the estimated quantity shall be repaired at the same unit cost shown in the Bid Form.

F. Alternate Base Bid Item #3 – Flocculation and Sedimentation Basins Structural Rehabilitation (SRF Scenario):

1. Measurement: As seen in the Repair Schedule below, this item includes all structural repair and rehabilitation work for the interior and exposed exterior surfaces of the flocculation and sedimentation basins as well as inside the below-grade walkway tunnel. Refer to Structural Plans and Specifications for additional information and details.

REPAIR SCHEDULE (SRF Scenario)					
Repair*	Type	Units	Unit Cost	Estimated Quantity	Total Cost
G	Gravity feed epoxy	LF	\$	350	\$
P	Epoxy injection	LF	\$	100	\$
C	Expansion joint crack repair	LF	\$	245	\$
E	Exposed rebar	LF	\$	16	\$
S	Concrete spall repair	SF	\$	-	\$
B	Remove existing coating system on bottom of floc/sed basins and replace with a new coating system.	SF	\$	7,200	\$
W	Remove existing coating system on walls of floc/sed basins and replace with a new coating system.	SF	\$	35	\$
F	Remove and replace existing failing repair	CF	\$	300	\$
A	Corbel repair	EA	\$	1	\$
T	Apply new coating system to the inside walls of the	SF	\$	4,500	\$

	floc/sed basin troughs				
D	Strip rusted steel to bare metal. Clean steel in accordance with SSPC3 and paint with zinc rich primer before applying new paint system to match existing.	SF	\$	350	\$
U	Underpin the existing concrete pad to at least 2 ft below existing grade	CF	\$	100	\$
R	Existing steel beam has deteriorated at the end and needs to be replaced. Provide a new section and connections to match the existing and install to match the existing. Shore all remaining elements supported by the beam and shall be shored and reattached to the beam.	LS	\$	1	\$
Total Cost, Structural Repair and Rehabilitation Work (SRF Scenario)				\$	
* Refer to Structural Plans and Specifications for location(s) as well as additional clarification and detail					

2. Payment: For Alternate Base Bid #3 (SRF Scenario), payments for the work specified under this Section shall be paid for at the unit price indicated and for the estimated quantities indicated above. Compensation will be in accordance with Contract Documents for the actual quantities repaired at the unit price indicated on the Bid Form.
 - a. Quantities not used shall be credited back to the Owner at the same unit cost shown in the Bid Form.
 - b. Quantities repaired in excess of the estimated quantity shall be repaired at the same unit cost shown in the Bid Form.

G. Add Alternate Bid Item #4 – Fort Thomas Diversion Piping Modifications (Non-SRF Scenario)

1. Measurement:
 - a. This work shall only be performed if accepted and authorized by the Owner.
 - b. If accepted and authorized by the Owner, Contractor shall perform all work associated with Fort Thomas diversion piping modifications, which include removing existing piping, fittings, and appurtenances; furnishing and installing piping, fittings, valves with electric motor actuators, and appurtenances; and associated electrical and controls work.

- 1) Install new electrical conduit and wiring from the new valve actuators to the power source identified on the Plans.
 - 2) Install new signal conduit and wiring from valve actuators (basement) up to the main plant SCADA (second floor).
 - a) Contractor shall label and tag all new conductors; make final terminations at Main Plant SCADA; and prepare and provide as-builts for final P&ID on plans; and
 - b) Owner will update/modify the main plant SCADA for the new valve actuators associated with diverting water to the clearwell supplied directly from the Fort Thomas supply line.
2. Payment: If authorized and accepted by the Owner, the work specified under this Section shall be paid for at the contract lump sum price for Add Alternative Bid Item #4. Payments shall be in accordance with Contract Documents.

Notes: 1) This item shall be considered an add alternate bid item. Should the Owner exercise its right and include the add alternate work as part of the Contract, then the Contractor will be paid for the work completed. 2) However, should the Owner not exercise its option to authorize the add alternate work, no payment shall be made to the Contractor.

- H. Add Alternate Bid Item #5 – Fort Thomas Diversion Piping Modifications (SRF Scenario)
1. Measurement:
 - a. This work shall only be performed if accepted and authorized by the Owner.
 - b. If accepted and authorized by the Owner, Contractor shall perform all work associated with Fort Thomas diversion piping modifications, which include removing existing piping, fittings, and appurtenances; furnishing and installing piping, fittings, valves with electric motor actuators, and appurtenances; and associated electrical and controls work.
 - 1) Install new electrical conduit and wiring from the new valve actuators to the power source identified on the Plans.
 - 2) Install new signal conduit and wiring from valve actuators (basement) up to the main plant SCADA (second floor).
 - a) Contractor shall label and tag all new conductors; make final terminations at Main Plant SCADA; and prepare and provide as-builts for final P&ID on plans; and
 - b) Owner will update/modify the main plant SCADA for the new valve actuators associated with diverting water to the clearwell supplied directly from the Fort Thomas supply line.
 2. Payment: If authorized and accepted by the Owner, the work specified under this Section shall be paid for at the contract lump sum price for Add Alternative Bid Item #5. Payments shall be in accordance with Contract Documents.

Notes: 1) This item shall be considered an add alternate bid item. Should the Owner exercise its right and include the add alternate work as part of the Contract, then the

Contractor will be paid for the work completed. 2) However, should the Owner not exercise its option to authorize the add alternate work, no payment shall be made to the Contractor.

I. Add Alternate Bid Item #6 – UV LED System (Non-SRF Scenario)

1. Measurement:

- a. Contractor shall furnish and install an Ultraviolet (UV) LED System complete, including: removing and disposing of two (2) existing in-line UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new in-line UV LED System with UV LED Reactor and UV LED Lamp Modules (3 total), Remote HMI Station, piping, fittings, and appurtenances as well as cooling water supply and drain piping for each of the UV LED Modules, and associated electrical and controls work.
 - 1) Contractor shall label and tag all new conductors; make final terminations at Main Plant SCADA; and prepare and provide as-builts for final P&ID on plans; and
 - 2) Owner will update/modify the main plant SCADA for the new UV LED System.
- b. On the Bid Disclosure Form (Section 004113), Bidder shall indicate the cost difference between furnishing and installing a medium-pressure UV system (Base Bid Item #1, Non-SRF Scenario) and a UV LED system (Add Alternate Bid Item #6, Non-SRF Scenario).
- c. The Owner will determine if a medium-pressure UV system or a LED UV system will be furnished and installed with this work using the completed Questionnaire provided in Section 004113 along with the Alternate Bid Price.

2. Payment:

- a. If LED UV is selected by the Owner and the work is authorized:
 - 1) Work for Base Bid Item #1 will not be required.
 - 2) Payment for furnishing and installing a LED UV system will be the total sum of Base Bid Item #1 (Non-SRF Scenario) and the addition or deduction of Add Alternative Bid Item #6 (Non-SRF Scenario).
 - 3) Payments shall be in accordance with Contract Documents.
- b. If LED UV is not selected by the Owner:
 - 1) Work for Add Alternative Bid Item #6 (Non-SRF Scenario) is not authorized and no payments shall be made to the Contractor.
 - 2) The addition or deduction cost indicated on the Bid Disclosure Form will not be applied to the total sum cost for the project.

J. Add Alternate Bid Item #7 – UV LED System (SRF Scenario)

1. Measurement:

- a. Contractor shall furnish and install an Ultraviolet (UV) LED System complete, including: removing and disposing of two (2) existing in-line UV treatment systems, control panels, UPS panels, piping, fittings, and appurtenances; installing one (1) new in-line UV LED System with UV LED Reactor and UV LED Lamp Modules (3 total), Remote HMI Station, piping, fittings, and appurtenances as well as cooling water

supply and drain piping for each of the UV LED Modules, and associated electrical and controls work.

- 1) Contractor shall label and tag all new conductors; make final terminations at Main Plant SCADA; and prepare and provide as-builts for final P&ID on plans; and
 - 2) Owner will update/modify the main plant SCADA for the new UV LED System.
- b. On the Bid Disclosure Form (Section 004113), Bidder shall indicate the cost difference between furnishing and installing a medium-pressure UV system (Alternate Base Bid Item #1, SRF Scenario) and a UV LED system (Add Alternate Bid Item #7, SRF Scenario).
 - c. The Owner will determine if a medium-pressure UV system or a LED UV system will be furnished and installed with this work using the completed Questionnaire provided in Section 004113 along with the Alternate Bid Price.
3. Payment:
- a. If LED UV is selected by the Owner and the work is authorized:
 - 1) Work for Alternate Base Bid Item #1 (SRF Scenario) will not be required.
 - 2) Payment for furnishing and installing a LED UV system will be the total sum of Alternate Base Bid Item #1 (SRF Scenario) and the addition or deduction of Add Alternative Bid Item #7 (SRF Scenario).
 - 3) Payments shall be in accordance with Contract Documents.
 - b. If LED UV is not selected by the Owner:
 - 1) Work for Add Alternative Bid Item #7 (SRF Scenario) is not authorized and no payments shall be made to the Contractor.
 - 2) The addition or deduction cost indicated on the Bid Disclosure Form will not be applied to the total sum cost for the project.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 010410

WORK COORDINATION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. The Contractor shall coordinate all work for its subcontractors to assure satisfactory, expeditious completion of the Work within the Contract time. Contractor shall cooperate with all subcontractors, manufacturers, fabricators, suppliers, distributors, installers, testing agencies, and all others whose services, materials, or equipment are required to assure completion of the Work within the contract time.
- B. The Contractor shall review progress schedules and installation procedures under all sections and contracts which may affect its work and shall coordinate the installation of all such work with the appropriate party or parties.
- C. The Contractor shall at all times comply with all applicable OSHA safety regulations.
- D. Progress Meetings shall be held on a monthly basis unless it is mutually agreed by all parties that another schedule is suitable.
- E. The first meeting shall be held immediately upon execution of the Contracts to provide, among other things, allocate space requirements on the sites, Contractor's use of the premises, and future meetings. This meeting may be concurrent with Pre-Construction Conference required by the Contract Documents, unless otherwise directed by the Owner.
- F. Scheduled progress meetings are primarily, but not limited to, for all parties to discuss the current status of the construction, to discuss projected work schedules and if there are any issues that affect the critical path of the work, review and resolve construction conflicts, and work arrangements and responsibilities.
- G. Progress Meetings will be arranged through the Engineer and shall be separate from and in addition to coordination meetings. Engineer will keep record notes, write up, and distribute the minutes for each meeting.
- H. Representatives of the Contractor at the meetings shall have the competence and authority to make any necessary decisions. Their decisions and statements shall commit the Contractor to the agreed procedures, sequence of operations and schedules.

- I. Failure to be represented at these meetings shall cause the Contractor to be liable for any and all damages, delays, costs of alterations, and other costs which result because they were not present to arrange coordination of their work with the scheduled construction activities.
- J. Engineer will provide the date and time, place and tentative agenda for scheduled Progress Meetings for Contractor, Owner, and other necessary parties. If the Contractor cannot, for compelling reasons, attend a meeting, he shall give timely notice so that the meeting may be rescheduled. The Contractor may initiate a meeting by addressing a request to Engineer.
- K. Contractor shall provide the date and time, place and tentative agenda for scheduled coordination meetings so that Engineer and Owner representatives may attend.
- L. Where procedures have been agreed upon and coordination drawings accepted by the Contractor, it shall become binding upon Contractor to follow the drawings and procedures, both as to time and performance.
- M. The Contractor shall maintain at the site sufficient competent personnel for the purpose of preparing layout and coordination drawings. Where such drawings are to be prepared by Subcontractors, the Subcontractor shall have the required personnel on site. The Contractor shall be responsible for providing its own drafting equipment and supplies.

1.2 CONSTRUCTION SCHEDULING CONSIDERATIONS AND LIMITATIONS

- A. The Contractor shall minimize the number of outages at the water treatment facility and the impact on plant operations. When preparing a construction schedule, the Contractor shall consider the following:
 - 1. The piping for existing UV Train #1 shall not be removed until the work for the new UV Train is complete, accepted by Owner and Engineer, and available to be placed back into regular service.
 - 2. Only one (1) flocculation-sedimentation basin will be out of service at a time since at least one basin must remain in service throughout the construction period. The Contractor will be authorized to begin work on the second basin upon completion and acceptance of work for the first basin. The Owner will be responsible for draining and refilling the basins.
 - 3. The Contractor shall complete the construction of the new PAC Room in the Chemical Building along with the installation of all associated storage and feed equipment, which shall be done before the current PAC storage and feed systems are removed from service. Removal of the current PAC systems shall not occur until Owner and Engineer acceptance of the new PAC systems, including acceptance from applicable inspection officials.
 - a. The PAC work cannot occur until the existing filter-aid systems have been removed from their current location, and this cannot be

done until the new filter-aid systems are installed, operational, and accepted by Owner and Engineer.

4. The Contractor shall complete the construction of the new filter-aid storage and feed system in the Chemical Building along with the installation of all associated storage and feed equipment, which shall be done before the current filter-aid storage and feed systems are removed from service. Removal of the current filter-aid systems shall not occur until Owner and Engineer acceptance of the new filter-aid systems.
 - a. The PAC work cannot occur until the existing filter-aid systems have been removed from their current location, and this cannot be done until the new filter-aid systems are installed, operational, and accepted by Owner and Engineer.
5. The Contractor shall consider that finished water pumps 1, 2 and 6 can only be out of service for up to six (6) hours at a time.
6. Electrical outages shall be requested by the Contractor in writing to the Owner at least seven (7) days in advance of the planned outage. At a minimum, the request should include the reason for the outage, what portions of the plant will be without service, what the time shutdown would begin, and the estimated duration of the outage. The Contractor shall preposition equipment, materials, and personnel in advance so as to keep the duration of the outage to a minimum.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 010500

FIELD ENGINEERING

PART 1 – GENERAL

1.1 GENERAL

- A. As required, Contractor shall:
 - 1. Provide civil or other professional engineering services specified, or as required, to execute Contractor's construction methods.
 - 2. Develop and make all detail surveys and measurements needed for construction including slope stakes, batter boards, piling layouts and all other working lines, elevations and cut sheets.
 - 3. Provide all material required for bench marks, control points, batter boards, grade stakes, and other items.
 - 4. Be solely responsible for all locations, dimensions, and levels. No data other than written direction of the Owner or designated representative shall justify departure from the dimensions and levels required by the Drawings.
 - 5. Safeguard all points, stakes, grade marks, monuments and bench marks made or established on the Work, re-establish same if disturbed and rectify all Work improperly installed because of not maintaining, not protecting, or removing without authorization such established points, stakes, marks, and monuments.
 - 6. When requested by the Owner or designated representative, provide such facilities as may be necessary for Owner or designated representative to check line and grade points placed by the Contractor. Where applicable, Contractor shall do no excavation or embankment work until cross-sectioning necessary for determining pay quantities had been completed and checked by Owner or designated representative.
 - 7. All computations necessary to establish the exact position of the work shall be made and preserved by the Contractor. All computations, survey notes and other records necessary to accomplish the work shall be neatly made, shall be made available to the Owner or designated representative upon request, and shall become the property of the Owner.

1.2 CONTRACTOR'S FIELD STAFF

- A. Contractor shall employ and retain at the site of the Work competent field staff capable of performing all tasks required of the Contractor. Tasks included are:
 - 1. Preparing and submitting a report of each day's work activities to the Owner or designated representative. Contractor shall submit the daily report via e-mail to the Owner or designated representative. Information on the daily report should include, but is not limited to:

- a. Contractor and subcontractors onsite, and the number of employees for each.
 - b. Breakdown of employees by trade.
 - c. Major construction equipment on-site and equipment utilized.
 - d. Location of all areas in which construction was done.
 - e. Materials and equipment received and sent out.
 - f. Submit daily reports to Owner on weekly basis.
 - g. Any other information relevant to the work performed that day.
2. Provide all surveying equipment required including transit, level, stakes and required surveying accessories.
 3. Furnish all required lines and grades for construction of operations. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment.
 4. Maintain field files and drawings, record drawings, and coordinate engineering services with subcontractors. Prepare layout and coordination drawings for construction operations.
 5. Check and coordinate Work for conflicts and interferences and immediately advise Owner or designated representative of all discrepancies noted.
 6. Cooperate with Owner or designated representative and on-site representatives in field inspections as required.
 7. Contractor shall have a camera available to photograph the progress of work as well as photograph areas to provide clarification to potential issues that require Owner and Engineer resolution.
 8. Provide contact information for key administration and field personnel.

1.3 RECORDS

- A. If survey work is performed by the Contractor, then maintain a complete, accurate log of all control and survey work as it progresses.
 1. The Contractor shall provide NKWD and Engineer with survey information when requested and/or if there is a discrepancy with the Engineer's survey information.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 010900

REFERENCE STANDARDS

PART 1 – GENERAL

1.1 REQUIREMENTS INCLUDED

- A. When a reference standard is specified, the Contractor shall comply with requirements and recommendations stated in that standard, except when they are modified by the Contract Documents, or when applicable laws, ordinances, rules, regulations or codes establish stricter standards. The latest provisions of applicable standards shall apply to the Work, unless otherwise specified.

1.2 SCHEDULE OF REFERENCES

- A. Reference standards include, but are not necessarily limited to, the following:
1. Aluminum Association
 2. American Association of State Highway and Transportation Officials (AASHTO)
 3. American Concrete Institute (ACI)
 4. American Institute of Steel Construction (AISC)
 5. American Iron and Steel Institute (AISI)
 6. American Nations Standards Institute (ANSI)
 7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
 8. American Society of Mechanical Engineers (ASME)
 9. American Society for Testing and Materials (ASTM)
 10. American Water Works Association (AWWA)
 11. American Welding Society (AWS)
 12. Asphalt Institute (AI)
 13. Concrete Reinforcing Steel Institute (CRSI)
 14. Ductile Iron Pipe Research Association (DIPRA)
 15. Expansion Joint Manufacturers Association (EJMA)
 16. Factory Mutual Association (FMA)
 17. Institute of Electrical and Electronics Engineers (IEEE)
 18. National Association of Architectural Metal Manufacturers (NAAMM)
 19. National Electrical Code (NEC)
 20. National Electrical Manufacturers Association (NEMA)
 21. National Fire Protection Agency (NFPA)
 22. Portland Cement Association (PCA)
 23. Prestressed Concrete Institute (PCI)
 24. Regulations and Standards of the Occupational Safety and Health Act (OSHA) of the U.S. Department of Labor and the State of Ohio
 25. Steel Structures Painting Council (SSPC)

26. Underwriters Laboratories, Inc. (UL)
27. Uniform Building Code (UBC)
28. All other applicable standards listed in the Specifications, and the standards of utility service companies, where applicable.
29. All other applicable local, state, and federal codes, regulations, and standards.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 012100

PRE-CONSTRUCTION MEETING

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

- A. General and Supplementary Conditions, including Supplemental Conditions SRF
- B. Section 010410 – Work Coordination
- C. Section 012200 – Progress Meetings

1.2 PRE-CONSTRUCTION CONFERENCE

- A. Engineer will coordinate and schedule a pre-construction meeting within 10 days after execution of contract and before construction is started at the job site. Engineer will prepare a meeting agenda and distribute meeting minutes to attendees and other Owner and Engineer representatives.
- B. Attendance: Owner's representatives, Engineer, Contractor's representatives, and key subcontractors as required.
 - 1. Contractor's representatives shall include, as a minimum, the Project Manager/Engineer and the Superintendent/Foreman. Other key personnel are highly encouraged to attend.
- C. Agenda items to be discussed may include, but not limited to, the following:
 - 1. Contractor's use of premises
 - 2. Distribution of Conformed Contract Documents
 - 3. Submittal of list of subcontractors, list of products, schedule of values, and responsible personnel
 - 4. Designation of responsible personnel, including those identified for site access cards.
 - 5. Procedures for processing of, but limited to, the following:
 - a. field decisions/requests for information;
 - b. submittals;
 - c. applications for payments;
 - d. proposal request and change orders;
 - e. contract closeout procedures; and
 - f. other construction administration forms and documents.
 - 6. Proposed work plan and construction schedule. Discuss work activities that will/may impact plant operations for such as, but not limited to:
 - a. Temporary power outages/shutdowns;
 - b. Chemical feed operations;

- c. Deliveries, stockpiles, site usage, etc.
- d. Treatment operations; and
- e. Sequence of work.
- 7. Schedule of values
- 8. Site Safety
- 9. Site Security
- 10. Other administrative or Work related items.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 012200

PROGRESS MEETINGS

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

- A. Section 010410 – Work Coordination
- B. Section 012100 – Pre-Construction Meeting
- C. Section 013100 – Progress Schedules
- D. Section 013000 – Submittals
- E. Section 017200 – Record Documents

1.2 PROGRESS MEETINGS

- A. Regular monthly construction progress meetings: As mutually agreed upon by Owner and Contractors. Meetings between contractor personnel and the Owner may be scheduled on a more frequent basis during periods of critical work sequencing.
- B. The Engineer or their designated representative will prepare agenda and preside at meetings, record minutes, and distribute copies of proceedings to attendees.
- C. Location of Meetings: Owner will provide meeting facilities, which will likely be in the Main Filter Building conference room. The administrative portion of the meeting will typically be done in the conference room, and followed by a walk-through of the work areas to observe the progress of work as well as discuss, and resolve, any current or future issues.
- D. Attendance: Contractor, job superintendent, and subcontractors and suppliers as appropriate to agenda; Owner's representatives, Engineer and others as needed.
- E. Agenda items to be discussed shall include, but not limited to, the following:
 - 1. Approval of minutes of previous meetings
 - 2. Discuss the progress of work and the work completed since the previous meeting
 - 3. Proposed work until the next planned progress meeting
 - 4. Coordination of work with Owner or others for upcoming work
 - 5. Review/discuss the construction progress schedule and, if needed, discuss proposed corrective measures to regain projected schedules

6. Identify problems that may impede planned progress
7. Field observations, problems, and decisions
8. Review status of submittals
9. Review status of requests for information (RFIs)
10. Review status of other construction administration documents
11. Other construction administration business or Work related items

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

Section 013000

SUBMITTALS

1. PROGRESS SCHEDULE. After the preconstruction conference and before Work is started, Contractor shall submit to Engineer for review a schedule of the proposed construction operations. Owner shall cooperate with Contractor in arrangements for continuity of service and operation of valves and other control facilities. The progress schedule shall indicate the sequence of the Work, the time of starting and completion of each part, and the time for making connections to existing piping, structures, or facilities.

2. PROGRESS REPORTS. A progress report shall be furnished to Engineer with each Application for Payment. If the Work falls behind schedule, Contractor shall submit additional progress reports at such intervals as Engineer or Owner may request.

Each progress report shall include sufficient narrative to describe current and anticipated delaying factors, their effect on the progress schedule, and proposed corrective actions.

Any Work reported complete, but which is not readily apparent to Engineer, must be substantiated with satisfactory evidence.

3. SURVEY DATA. All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Owner or Engineer for examination throughout the construction period. All such data shall be submitted to Engineer with the other documentation required for final acceptance of the Work.

4. WORK PLANS. Subject to Owner and Engineer approval, the Contractor shall prepare and submit a detailed site specific work plan addressing the proposed means and methods for executing the work safely and within the agreed upon contract period.

5. SHOP DRAWINGS AND ENGINEERING DATA.

5.01. General. Shop Drawings and engineering data (submittals) covering all equipment and fabricated and building materials which will become a permanent part of the Work under this Contract shall be submitted to Engineer, at the Engineer's address given in the Agreement. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment. When an item consists of components from several sources, Contractor shall submit a complete initial submittal including all components.

All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this Contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor shall be solely responsible for the completeness of each submission. Contractor's stamp of approval is a representation to Engineer that Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that Contractor has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.

All deviations from the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor.

One copy of each drawing and necessary data shall be submitted to Engineer for its record. The Engineer intends to use this for information only. If requested by Contractor, up to three additional copies may be submitted for review and approval by Engineer. Engineer will return marked copies (or one marked reproducible copy) to Contractor. Engineer will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

5.02. Engineer's Review of Submittals. Engineer's review of submittals will cover only general conformity to the Drawings and Specifications, external connections, and dimensions which affect the layout. Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. Engineer's review shall not relieve Contractor of Contractor's sole responsibility for errors, omissions, or deviations in the drawings and data, nor of Contractor's sole responsibility for compliance with the Contract Documents.

If Contractor requests a review and response, Engineer's submittal review period shall be 14 consecutive calendar days in length and shall commence on the first calendar day immediately following the date of arrival of the submittal or resubmittal in Engineer's office. The time required to mail the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period.

When the drawings and data are returned marked "NOT ACCEPTABLE" or "RETURNED FOR CORRECTION", the corrections shall be made as noted thereon and as instructed by Engineer and corrected copies (or one corrected reproducible copy) resubmitted.

When the drawings and data are returned marked "EXCEPTIONS NOTED", "NO EXCEPTIONS NOTED", or "RECORD COPY", no additional copies need be furnished unless requested by Engineer at time of review.

5.03. Resubmittal of Drawings and Data. Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal.

When corrected copies are resubmitted, Contractor shall, in writing, direct specific attention to all revisions and shall list separately any revisions made other than those called for by Engineer on previous submissions.

Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the resubmittal.

Re-submittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is directly caused by a change in the Work authorized by a Change Order.

End of Section

SECTION 013100
PROGRESS SCHEDULES

PART 1 – GENERAL

1.1 REQUIREMENTS

- A. Procedures for preparation and submittal of Construction Progress Schedules and periodic updates.

1.2 RELATED REQUIREMENTS

- A. General and Supplementary Conditions, including Supplemental Conditions SRF
- B. Section 010100 – Summary of Work
- C. Section 013000 – Submittals
- D. Section 013700 – Schedule of Values

1.3 FORMAT

- A. Prepare network analysis system using the critical path method, as outlined in The Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors".
- B. Contractor shall use Microsoft Project, Primavera, or similar project management software (as approved by Engineer) to show progress schedule.
- C. Sheet Size: 11-inches by 17-inches.
- D. Contractor shall submit electronic copies of the construction schedule and updates via email and/or file sharing, and, upon request, a hard copy.

1.4 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Incorporate anticipated work days, non-work days, and other activities that will or may impact the Work schedule.
- C. Provide separate schedule of anticipated dates for providing submittals for review and approval. Annotate any submittals that require an expedited review.

- D. Coordinate content with Section 013700 - Schedule of Values.

1.5 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Include corrective or proposed actions taken and its effect.

1.6 SUBMITTALS

- A. Submit initial Schedules within 15 days after date of execution of Agreement or at least 20 days prior to submitting first application for progress payment.
- B. Submit updated schedules at Progress Meetings.
- C. Failure of the Contractor to comply with the schedule requirements shall be sufficient justification to withhold, in part or total, payments due to the Contractor.
- D. The Contractor shall submit an updated construction schedule to the Owner and Engineer on a monthly basis. An approved monthly schedule shall be a prerequisite for payment to the Contractor each month.

1.7 DISTRIBUTION

- A. Distribute copies of reviewed Schedules to job site file/superintendent, Owner representatives, Engineer, Subcontractors (as necessary), Suppliers, and other concerned entities.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in Schedules.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 013700
SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

- A. General and Supplementary Conditions, including Supplemental Conditions SRF
- B. Section 010100 - Summary of Work
- C. Section 010170 - Measurement and Payment

1.2 FORMAT

- A. Submit electronic file of Schedule of Values to Owner and Engineer for review and approval. File shall be in Microsoft Office format.

1.3 CONTENT

- A. Schedule shall show a sufficient breakdown of the lump sum costs from the Bid and the labor, materials, equipment and other costs used in preparation of the Bid.
- B. Costs shall be in sufficient detail to indicate separate amounts for each Section of the Specifications and in a format consistent with bid items.
- C. Use Table of Contents and bid form of the Specifications as basis for Schedule format and identify each item with number and title in the Table of Contents. List sub-items of major products or systems as appropriate (i.e., lump sum bid items) or when requested by Owner or Engineer.
- D. The sum of the individual values shown on the Schedule of Values must equal the total Contract Price.
- E. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
- F. Schedule shall show the purchase and delivery costs for materials and equipment that the Contractor anticipates he shall request payment for prior to their installation.

1.4 SUBMITTAL

- A. Submit Schedule a minimum of 20 days prior to first Application for Progress Payment to Owner and Engineer.
- B. No partial payment will be made until the schedule of values is approved by the Engineer.
- B. A construction schedule shall be provided with the initial Schedule of Values. Once approved, the Schedule of Values shall be updated as part of future payment application requests.

1.5 SUBSTANTIATING DATA

- A. When the Owner or Engineer requires substantiating information and/or breakdown clarification, Contractor shall submit an updated Schedule.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

Section 014000

QUALITY CONTROL

1. TESTING SERVICES. All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to Owner. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards.

Testing services provided by Owner are for the sole benefit of Owner; however, test results shall be available to Contractor. Testing necessary to satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor.

1.01. Testing Services Furnished by Contractor. Unless otherwise specified, Contractor shall provide all testing services in connection with the following:

Concrete materials and mix designs.

Asphaltic concrete materials and mix designs.

Embedment, fill and backfill materials.

All other tests and engineering data required for Engineer's review of materials and equipment proposed to be used in the Work.

Contractor shall obtain Owner's acceptance of the testing firm before having services performed, and shall pay all costs for these testing services.

1.02. Transmittal of Test Reports. Written reports of tests and engineering data furnished by Contractor for Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified in Specification Section 013000.

2. PROFESSIONAL ENGINEER QUALIFICATIONS: When required or the responsibility of the Contractor, the Contractor shall retain the services of a professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

End of Section

Section 015000

TEMPORARY FACILITIES

Based on the scope of services for this work, some of the items below may or may not apply. If so, the Contractor shall comply in accordance with specifications herein and the Contract Documents.

1. PRESENCE IN THE AREA. The Contractor understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Work Site which will allow it to respond to an emergency at the Work Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Contractor shall provide a list of emergency phone numbers for such purposes. If the Contractor does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does have such a presence, provided that any such sub-contractor must be approved by the Owner, in its sole discretion, prior to the pre-construction meeting.

2. WATER. Water in reasonable amounts required for and in connection with the Work to be performed will be furnished by Owner without charge to Contractor. All water used in testing and disinfection of mains will be furnished by the Owner for the first test only. Contractor shall furnish necessary pipe, hose, nozzles, and tools and shall perform all necessary labor. Contractor shall make arrangements with Owner (who will fix the time, rate, and duration of each withdrawal from the distribution system) as to the amount of water required and the time when the water will be needed. Unnecessary waste of water will not be tolerated. Special hydrant wrenches shall be used for opening and closing fire hydrants. In no case shall pipe wrenches be used for this purpose.

3. POWER. Contractor shall provide all power for heating, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor. Contractor may coordinate with Owner for connection to available electrical services on the treatment plant site.

4. TELEPHONE SERVICE. Contractor shall make all necessary arrangements and pay all installation charges for telephone lines in its offices at the Site and shall provide all telephone instruments. Contractor shall provide Owner with contact information for key personnel.

5. SANITARY FACILITIES. Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services for the Work. Contractor shall not use sanitary facilities inside existing treatment buildings on-site at the Taylor Mill Treatment Plant.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

6. MAINTENANCE OF TRAFFIC.

On-Site: Contractor shall coordinate with Owner for routing of vehicles and parking for personnel. Contractor shall strictly adhere to restricted areas for construction vehicles and heavy vehicle traffic.

Off Site: Contractor shall conduct their work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

The Contractor shall wherever necessary or as required by the Owner or the authority having jurisdiction provide, erect and maintain proper lights, signs, barricades, temporary guardrail, other traffic control devices, and furnish watchmen and flagmen as may be necessary to maintain safe traffic conditions in accordance with the Manual of Uniform Traffic Control Devices. Contractor shall use standard signage found in the latest edition of the Federal Highway Administration's "Standard Highway Signs and Markings" manual.

The Contractor shall be liable for and hold the Owner free and harmless from all damages occasioned in any way by its actions or neglect or those of its agents, employees, or workmen.

Work that requires the Contractor to shut down the road on weekends or at nights is considered an incidental to the overall Work.

The Contractor at all times shall conduct the work in such manner as to cause as little interference as possible with private business or with private and public travel on the public highway. All damage (other than that resulting from normal wear and tear) to existing roads or pavements shall be repaired to withstand traffic in a safe condition.

Where the Contractor finds it necessary to remove excavated material to some other location, care should be taken not to overload trucks, which would in turn spill material out upon highways. Any such material spilled upon highways shall be immediately cleaned up from the location and properly disposed of per applicable regulation.

Where it is necessary and is agreeable with public and private property owners, excavated materials may be temporarily piled in the streets or roadways, however, one lane of traffic must be maintained at all times.

After excavated materials have been removed, all hard surface streets or roadways shall be thoroughly cleaned and left free of dirt, gravel and dust. Streets or roadways, which do not have hard surfaces, must be restored to their original condition at the expense of the Contractor. Streets and roadways shall be kept in a safe and passable condition at all times.

6.01. Temporary Bridges. Contractor shall construct substantial bridges at all points where it is necessary to maintain traffic across pipeline construction. Bridges in public streets, roads, and highways shall be acceptable to the authority having jurisdiction thereover. Bridges erected in private roads and driveways shall be adequate for the service to which they will be subjected. Bridges shall be provided with substantial guardrails and with suitably protected approaches. Footbridges shall be at least 4 feet wide, provided with handrails and uprights of dressed lumber. Bridges shall be maintained in place as long as the conditions of the Work require their use for safety of the public. When necessary for the proper prosecution of the Work in the immediate vicinity of a bridge, the bridge may be relocated or temporarily removed for such period as Owner may permit.

6.02. Detours. Where required by the authority having jurisdiction thereover that traffic be maintained over any construction work in a public street, road, or highway, and the traffic cannot be maintained on the alignment of the original roadbed or pavement, Contractor shall, at its own expense, construct and maintain a detour around the construction work. Each detour shall include a bridge across the pipe trench and all necessary barricades, guardrails, approaches, lights, signals, signs, and other devices and precautions necessary for protection of the Work and safety of the public.

7. BARRICADES AND LIGHTS. All streets, roads, highways, and other public thoroughfares, which are closed to traffic, shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section.

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions, such as material piles and equipment, shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.

All barricades, signs, lights, and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within railroad and highway rights-of-way, as required by the authority having jurisdiction thereover.

8. TRAFFIC CONTROL. In addition to the requirements of the maintenance of traffic and barricades and lights paragraphs in this section, traffic control shall be as set forth herein.

During periods of inclement weather, rush-hour traffic, or during periods of unusually heavy traffic, the Owner may require the Contractor to cease operations in order to adequately handle the traffic. The Owner reserves the right to require the suspension or delay of certain operations, or the expediting of other operations, at no additional cost to the Owner, to provide a proper sequence of operations which will promote the satisfactory movement of traffic. The Owner may require additional barricades, lights, or flagmen at any time or at any place necessary for proper protection of traffic, but approval by the Owner of the Contractor's method of operation shall not relieve the Contractor of their responsibility to protect traffic.

Contractor shall take extra precautions to provide and maintain emergency access on all streets and roads and to all residential, commercial, and other properties for police and fire departments and emergency medical service throughout the construction operations.

Contractor shall maintain the use of existing walks for pedestrians at all times. Additional requirements are specified in the temporary bridge subparagraph in this section.

9. TRAFFIC CONTROL PLAN. To obtain a permit to work within public rights-of-way, Contractor may be required to prepare and submit to the appropriate agencies, a traffic control plan in conformance with the requirements of the authority having jurisdiction .

Coordinate with NKWD for proposed contractor vehicle traffic routing and traffic control measures to be employed on the treatment plant site.

10. FENCES. All existing fences affected by the Work shall be maintained by Contractor until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. A copy of all written permissions shall be submitted to Owner. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use.

On completion of the Work across any tract of land, Contractor shall restore all fences to their original or to a better condition and to their original location.

11. PROTECTION OF PUBLIC AND PRIVATE PROPERTY, DAMAGE TO EXISTING PROPERTY. Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by their construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod, shrubs, trees in yards, parkways, and medians shall be restored to their original or better condition, whether within or outside the easement. Unless otherwise specified, all replacements shall be made with new materials.

Sodded and landscaped areas on improved property (yards) shall be disturbed only to the extent required to permit construction. Such areas shall not be used as storage sites for construction supplies and, insofar as practicable, shall be kept free from stockpiles or excavated materials.

No trees shall be removed outside the permanent easement, except where authorized by Owner. Hand excavation shall be employed as necessary to prevent injury to trees. Trees left standing shall be adequately protected against damage from construction operations.

Contractor shall be responsible for all damage to streets, curbs/gutters, roads, sidewalks, shoulders, ditches, embankments, culverts, bridges, traffic loops and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by themselves or their Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property

concerning its repair or replacement or payment of costs incurred in connection with the damage and shall furnish a written verification of all agreements.

Should the Contractor's operations damage any existing underground or aboveground utility, installation, structure, or other construction, Contractor shall immediately notify the authority owning or having jurisdiction over and control of the utility, installation, structure, or other construction, and make a report of such damage. A copy of the report shall be submitted to the Owner. The damaged item shall be repaired immediately by and at the expense of the Contractor unless otherwise specified or acceptable to the authority or owner having jurisdiction over, or to the Owner.

The utility, installation, structure, or other structures damaged by Contractor's operations shall be repaired, replaced, or otherwise restored in accordance with the local ordinances, standards, and requirements of the applicable authority or owner having jurisdiction thereover and shall be subject to acceptance by the Owner.

Special precaution shall be taken by the Contractor to avoid damage to existing overhead and underground utilities owned and operated by the Owner or other public or private utility companies.

With particular respect to existing underground utilities, all available information concerning their location has been shown on the drawings. While it is believed that the locations shown are reasonably correct, the Owner cannot guarantee the accuracy or adequacy of this information.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, property owners, or departments that own and operate utilities in the vicinity of the construction work. The purpose of this conference or conferences shall be to notify said companies, agencies or departments of the proposed construction schedule, verify the location of and possible interference with the existing utilities, fire protection systems, lawn irrigation systems, etc., that are shown on the plans, arrange for necessary suspensions of service, and make arrangements to locate and avoid interference with all other utilities (including house connections) that are not shown on the plans. The Owner has no objection to the Contractor arranging for said utility companies, agencies, or departments to locate and uncover their own utilities, however, insofar as the Owner is concerned, the Contractor shall bear entire responsibility for locating and avoiding or repairing damage to said existing utilities.

Where existing utilities or other underground structures are encountered, they shall not be displaced or molested unless necessary, and in such case they shall be replaced in as good or better condition than found as quickly as possible. All such utilities that are so damaged or molested shall be replaced at the Contractor's expense unless in the opinion of the Owner such damage was caused through no fault or action of the Contractor.

It is expected that the Contractor will be diligent in its efforts and use every possible means to locate existing utilities. Any claims for unavoidable damage based on improper or unknown locations will be thoroughly examined in the light of the Contractor's efforts to locate the said utilities or obstructions prior to beginning.

When construction is completed, the private property owner's facilities and grounds shall be restored to as good or better condition than found and as quickly as possible at the Contractor's expense.

All water mains and water service connections damaged by Contract's operations will be repaired by the Owner at the expense of the Contractor unless other arrangements are made.

Customer irrigation piping damaged by Contractor's operations shall be repaired by and at the cost of the Contractor.

All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

12. TREE AND PLANT PROTECTION. Tree and plant protection is of prime importance. Except where otherwise authorized, indicated, or specified, no trees or plants shall be removed. Activities near trees that are to be protected shall be kept to a minimum. Tree protection shall also include trimming, when necessary, to prevent damage by construction equipment.

Trees and plants to be removed shall be removed in such a manner as to avoid injury to surrounding trees and plants. Contractor shall be responsible for disposal of all trees and plants removed or damaged.

13. HAUL ROUTES. Contractor shall obtain and pay for all necessary permits from the applicable authority having jurisdiction thereover to allow use of public streets to transport equipment and material to and from the Site. At such time the Contractor shall request the agency having jurisdiction to establish the haul routes. A copy of the permit and designated haul routes shall be provided to the Owner prior to commencement of Work in that area.

While on-site, Contractor personnel shall avoid driving heavy construction vehicles in or through restricted areas (see Paragraph 6 above).

14. PARKING. Contractor shall provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Work, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities.

Contractor shall clean up all parking areas used and return them to their original state.

The location of the Contractor's parking areas shall be acceptable to Owner, and the owner and tenant of private property or to the authority having jurisdiction over public property upon which the parking area will be located.

15. RESIDENTIAL PARKING. Contractor shall provide appropriate areas for residents to park their vehicles during the construction operations adjacent to their properties, if required. This shall include making the appropriate areas available to the residents by not storing construction materials or equipment in these areas and providing signs and other notification methods acceptable to the Owner for instructing the residents on the location of the temporary parking and its intended use.

Additional requirements for notifying property owners and tenants of available temporary parking are covered in the Work requirements section.

16. ACCESS ROADS. Contractor shall establish and maintain temporary access roads to various parts of the Site as required to complete the Work. Such roads shall be available for the use of all others performing work or furnishing services in connection with the Work.

17. NOISE CONTROL. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

During construction activities on or adjacent to occupied buildings, and when appropriate, Contractor shall erect screens or barriers effective in reducing noise in the building and shall conduct their operations to avoid unnecessary noise which might interfere with the activities of building occupants.

18. DUST CONTROL. Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust.

Buildings or operating facilities, which may be affected adversely by dust, shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

19. STORM WATER EROSION AND PREVENTION. The following is to be used as a guideline in conjunction with the plans for temporary drainage provisions, erosion control and pollution control as required by a Sanitation District #1 Permit and Kentucky Pollution Discharge Elimination System (KPDES). Reference "Kentucky Best Management Practices for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites" and the "Northern Kentucky Sanitation District No. 1 Storm Water Permitting Guide". Owner will assist the Contractor with obtaining required permits. Contractor shall be responsible for submitting and payment of fees for required permits.

19.01. GRADING PERMIT, NOTICE of INTENT and NOTICE of TERMINATION. The owner will be responsible for acquiring a Grading Permit from Sanitation District #1 and filing a Notice of Intent/Notice of Termination with the KPDES. A Grading Permit is necessary when the square footage of the pervious and impervious areas are equal to or greater than one acre.

A. Work is less than one acre:

- Best Management Practices that are shown on the plans and specifications are a minimum. Contractors are responsible for providing the minimum, and, if necessary will provide additional BMP's to satisfy the situation and the regulating authority.

B. Work is greater than one acre:

- Best Management Practices that are shown on the plans and specifications are a minimum. Contractors are responsible for providing the minimum, and, if necessary will provide additional BMP's to satisfy the situation and the regulating authority.
- Sanitation District #1 must be contacted at least 72 hours prior to any construction activity. (Andy Amen @ 859-578-6880)
- Site stabilization shall begin within 14 days where construction activity has permanently ceased.
- Site stabilization shall begin within 21 days where construction activity has temporarily ceased.
- BMP'S shall be checked a minimum of every 7 days and within 24 hours after a 0.5" rainfall. Contractor shall keep a maintenance log book that records the date, weather event, reason for inspection and signature. The maintenance log book shall be turned over to the Owner at the end of the Work.

19.02. TEMPORARY DRAINAGE PROVISIONS. Contractor shall provide for the drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site, and adjacent property.

Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding.

19.03. EROSION CONTROL. Contractor shall prevent erosion of soil on the Site and adjacent property resulting from it's construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operation that will disturb the natural protection.

Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

20. POLLUTION CONTROL. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance will be permitted to enter sanitary sewers, and reasonable measures shall be taken to prevent such materials from entering any drain or watercourse.

21. CUSTOMER NOTIFICATION. NKWD will discuss and respond to public or customer inquiries or complaints as well as any notifications that may need to be

provided. The Contractor shall immediately direct any public or customer inquiries or complaints to the NKWD POC (to be provided at the pre-construction meeting).

22. UNSAFE CONDITIONS. The Owner reserves the right to take whatever action necessary to correct an unsafe condition created by the Contractor at the Contractor's expense.

23. SECURITY. CONTRACTOR shall be responsible for protection of the Site, and all the Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

No Claim shall be made against OWNER by reason of any act of an employee or trespasser, and CONTRACTOR shall make good all damage to OWNER's property resulting from CONTRACTOR's failure to provide security measures as specified. Security measures shall be at least equal to those usually provided by OWNER to protect OWNER's existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the Site.

24. STREAM CROSSINGS. The following is reprint of the requirements and conditions for blue line stream crossings which shall be followed:

**SECTION 401 WATER QUALITY CERTIFICATION
CONDITIONS FOR NATIONWIDE PERMIT NO. 12
WITHIN THE COMMONWEALTH OF KENTUCKY**

**General Certification -Nationwide Permit #12 - Utility Line Backfill and
Bedding**

This General Certification is issued January 6, 2017, in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33USC 1314), as well as Kentucky Statute KRS 224.16-070.

The Commonwealth of Kentucky hereby certifies under Section 401 of the Clean Water Act (CWA) that it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 5, established pursuant to Sections 301, 302, 304, 306 and 307 of the CWA, will not be violated for the activity covered under 33 CFR Part 330 Appendix A(B) (12), namely utility line backfill and bedding provided that the following conditions are met:

1. This general Water Quality Certification is limited to the crossing of streams by utility lines. The length of a single utility crossing shall not exceed twice the width of the stream. This document does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.
2. The provisions of 401 KAR 5:005 Section 8 are hereby incorporated into this General Water Quality Certification. Namely, "Sewer lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGS 7 ½ minute topographic map except where the sewer alignment crosses the

stream. The distance shall be measured from the top of the stream bank. The cabinet may allow construction within the 50' buffer if adequate methods are used to prevent soil from entering the stream.

Gravity sewer lines and force mains that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the sewer line excavation shall not be allowed to enter the flowing portion of the stream." The provisions of this condition shall apply to all types of utility line stream crossings.

3. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished within 14 days after disturbance.
4. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.
5. This General Certification shall not apply to those waters of the Commonwealth identified as Outstanding Resource Waters, Exceptional Waters or Cold Water Aquatic Habitat Waters, as designated by the Division of Water. An individual Water Quality Certification will be required for projects in these waters.

Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

This General Certification is issued January 6, 2017, (expires 5 years from this date) in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33USC 1314), as well as Kentucky Statute KRS 224.16-070.

For additional information contact: Kentucky Division of Water, Water Quality Branch, 14 Reilly Road, Frankfort, Ky 40601 Phone (502)564-3410 Fax (502)564-4245

NATIONWIDE PERMIT CONDITIONS

GENERAL CONDITIONS: The Following general conditions must be followed in order for any authorization by a NWP to be valid:

1. Navigation. No activity may cause more than a minimal adverse effect on navigation.

2. Proper maintenance. Any structure of fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. Erosion and siltation controls. Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all

exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.

4. Aquatic life movements. No activity may substantially disrupt the movement of those species of aquatic life indigenous to the water body, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water.

5. Equipment. Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.

6. Regional and case-by-case conditions. The activity must comply with any regional conditions which may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state or tribe in its section 401 water quality certification.

7. Wild and Scenic rivers. No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designed by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status; unless the appropriate Federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely effect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service.)

8. Tribal rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. Water quality certification. In certain states, an individual Section 401 water quality certification must be obtained or waived (see CFR 330.4(c)).

10. Endangered Species.

a. No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the District Engineer if any listed species or critical habitat might be affected or is in the vicinity of the project, and shall not begin work on the activity until notified by the District Engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized.

b. Authorization of an activity by a nationwide permit does not authorize the take of a threatened or endangered species as defined under the Federal Endangered Species Act. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with incidental take provisions, etc.) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, both lethal and non-lethal takes of protected species are in violation of the Endangered Species Act. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. Fish and Wildlife Service and National Marine Fisheries Service or their world web pages at <http://www.fws.gov>.

11. Historic properties. No activity which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places is authorized, until the DE has complied with the provisions of 33 CFR Part 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places (see 33 CFR 330.4(g)).

12. Compliance certification. Every permittee who has received a Nationwide permit verification from the Corps will submit a signed certification regarding the completed work and any required mitigation. The certification will be forwarded by the Corps with the authorization letter and will include: a.) A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions; b.) A statement that any required mitigation was completed in accordance with the permit conditions; c.) The signature of the permittee certifying the completion of the work and mitigation.

13. Multiple use of Nationwide permits. In any case where any NWP number 12 through 40 is combined with any other NWP number 12 through 40, as part of a single and complete project, the permittee must notify the District Engineer in accordance with paragraphs a, b, and c on the Notification General Condition number 13. Any NWP number 1 through 11 may be combined with any other NWP without notification to the Corps, unless notification is otherwise required by the terms of the NWPs. As provided at 33 CFR 330.6 © two or more different NWPs can be combined to authorize a single and complete project. However, the same NWP cannot be used more than once for a single and complete project.

SECTION 404 ONLY CONDITIONS:

In addition to the General Conditions, the following conditions apply only to activities that involve the discharge of dredged or fill material into waters of the U.S., and must be followed in order for authorization by the NWPs to be valid:

1. Water supply intakes. No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

2. Shellfish production. No discharge or dredged or fill material may occur in areas of concentrated shellfish production, unless the discharge is directly related to a shellfish harvesting activity authorized by NWP 4.

3. Suitable material. No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.,) and material discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

4. Mitigation. Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e., on-site), unless the District Engineer approves a compensation plan that the District Engineer determines is more beneficial to the environment than on-site minimization or avoidance measures.

5. Spawning areas. Discharge in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

6. Obstruction of high flows. To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

7. Adverse effects from impoundments. If the discharge creates an impoundment of water, adverse effects on the aquatic system caused by the accelerated passage of water and /or the restriction of its flow shall be minimized to the maximum extent practicable.

8. Waterfowl breeding areas. Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

9. Removal of temporary fills. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

TERMS FOR NATIONWIDE PERMIT NO. 12

Utility Line Discharges. Discharges of dredged or fill material associated with excavation, backfill or bedding for utility lines, including outfall and intake structures, provided there is no change in pre-construction contours. A “utility line” is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquefiable, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone and telegraph messages, and rapid and television communication. The term “utility line” does not include activities which drain water of the United States, such as drainage tile, however, it does apply to pipes conveying drainage from another area. This NWP authorizes mechanized landclearing necessary for the installation of utility lines, including overhead utility lines, provided the cleared area is kept to the minimum necessary and pre-construction contours are maintained. However, access roads, temporary or permanent, or foundations associated with overhead utility lines are not authorized by this NWP. Material resulting from trench excavation may be temporarily sidecast (up to three months) into waters of the United States, provided that the material is not placed in such a manner that it is dispersed by currents or other forces. The DE may extend the period of temporary side-casting not to exceed a total of 180 days, where appropriate. The area of waters of the United States that is disturbed must be limited to the minimum necessary to construct the utility line. In wetlands, the top 6” to 12” of the trench should generally be backfilled with topsoil from the trench. Excess material must be removed to upland areas immediately upon completion of construction. Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line. (See 33 CFR Part 322).

Notification: The permittee must notify the district engineer in accordance with the "Notification" general condition, if any of the following criteria are met:

- a. Mechanized land clearing in a forested wetland;
- b. A Section 10 permit is required for the utility line;
- c. The utility line in waters of the United States exceeds 500 feet; or,
- d. The utility line is placed within a jurisdictional area (i.e., a water of the United States), and it runs parallel to a streambed that is within that jurisdictional area. (Sections 10 and 404)

25. PROJECT SIGNAGE Should the Project be funded using SRF Programs, then the Contractor shall also be required to furnish and install a physical project (72 in (W) x 48 in (H)) sign displaying the EPA emblem and identifying the project as a "project funded by U.S. Environmental Protection Agency." See https://www.epa.gov/sites/default/files/201607/documents/guidelines_for_enhancing_public_awareness_srf.pdf for guidance.

A copy of the guidance documents is provided following this Section.

End of Section



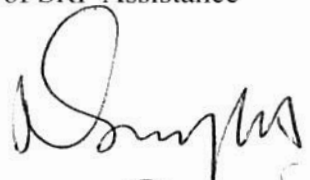
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WASHINGTON, D.C. 20460

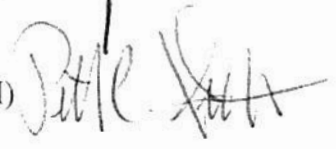
JUN - 3 2015

OFFICE OF WATER

MEMORANDUM

SUBJECT: Guidelines for Enhancing Public Awareness of SRF Assistance Agreements

FROM: Andrew D. Sawyers, Ph.D., Director
Office of Wastewater Management (4201M) 

Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M) 

TO: Water Management Division Directors
Regions I-X

Last year, the Environmental Protection Agency (EPA) implemented an agency-wide initiative to enhance public awareness of EPA assistance agreements nationwide. The Office of Water has developed guidelines to inform states how this initiative should be implemented in the State Revolving Fund (SRF) Programs.

The guidelines were developed with input from EPA and state SRF staff. The guidelines recognize that each of the state SRF programs and the projects they fund are different and that one implementation method will not work for everyone. Therefore, as a result of input from the states, the guidelines offer a number of options that can be used to enhance public awareness of SRF assistance agreements.

Implementation of these guidelines will begin with the awarding of the FY 2015 SRF capitalization grants. A term and condition on compliance with the guidelines is to be included in all new SRF grants.

Please have your staff provide copies of the guidelines to your states. Questions regarding the guidelines should be directed to Sheila Platt (202/564-0686) or Howard Rubin (202/564-2051).

Attachment

Enhancing Public Awareness of SRF Assistance Agreements

Introduction

The Environmental Protection Agency (EPA) is currently implementing an agency-wide initiative focused on signage to enhance public awareness of EPA assistance agreements nationwide. The intention of this effort is to communicate the positive impact and benefits of EPA funding around the country and increase awareness surrounding the improvements communities receive as a result of State Revolving Fund (SRF) assistance. Projects implemented with Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) monies are included in this initiative, as many CWSRF and DWSRF assistance agreements have direct and tangible benefits to populations around the country.

EPA's Office of Water developed these guidelines as a way to inform states of this directive and how it should be implemented in the SRF programs. The primary objective is to enhance public understanding of the positive benefits of CWSRF and DWSRF funding to towns, cities, municipalities and water systems. To that end, states are presented with a range of options for implementing these guidelines. All of these options achieve the ultimate goal of communicating to a broad audience the positive role EPA funding of the state CWSRF and DWSRF programs plays in communities across the country.

The information in the guidelines was developed with input from EPA and state staff across the country as well as the members of the State-EPA Workgroup. The guidelines recognize the wide range of project types, varied locations and different institutional approaches among states and communities. Therefore, providing states and SRF assistance recipients maximum flexibility is optimal. The guidelines allow selection of the implementation method which best balances two goals. First, it should satisfy the overall objective of communicating EPA's role in funding assistance agreements that achieve positive benefit. Second, the implementation method should be practically and financially viable for states and communities and avoid any overly burdensome investment of time and resources. In some cases, it might be appropriate for a state to select a combination of options listed below, provided this does not result in excessive cost to communities.

Project Selection Requirements

Signage requirements will not be required to apply to all SRF projects. Signage will be considered an equivalency requirement for SRF programs. States should select a set of borrowers and/or projects totaling a funding amount equivalent to the amount of their federal capitalization grant to satisfy the signage requirement. There are no other requirements or restrictions on which projects should or should not participate in this initiative. Therefore, it is at the discretion of the state SRF program to select projects most able to efficiently and effectively comply in a way that

meets the intention to enhance public awareness without significant financial hardship to the state or its borrowers. This can be done either through the selection of specific projects or borrowers, or by setting a threshold within the state for which projects will be requested to meet signage requirements. States should note that they have the option of selecting different implementation options for different borrowers depending on the location, project type and available resources. Borrowers and/or projects complying with the signage requirement must ensure limited English proficient individuals have meaningful access to activities receiving EPA funds, consistent with Executive Order 13166 and EPA Order 1000.32.

In this regard, to increase public awareness of projects serving communities where English is not the predominant language, States should encourage recipients when implementing a particular signage option to translate the language used (excluding the EPA logo or seal) into the appropriate non-English language(s). The costs of such translation are allowable, provided the costs are reasonable.

Although the signage requirement does not apply to all SRF projects, we recommend that states encourage all borrowers/projects to notify the public of the benefits of the projects and the role of the SRF, using one of the options below.

Summary of Options

The guidelines present a number of options which communities can explore to implement EPA's signage policy. The option selected should meet all of the above basic requirements while remaining cost-effective and accessible to a broad audience. The guidelines describe the following strategies as acceptable options for communities to follow:

- Standard signage
- Posters or wall signage in a public building or location
- Newspaper or periodical advertisement for project construction, groundbreaking ceremony, or operation of the new or improved facility
- Online signage placed on community website or social media outlet
- Press release

Each of these options is described in more detail in the sections below.

Implementation Option: Standard Signage

EPA recommends that large projects that involve significant expansion or construction of a new facility elect to publicize through standard signage. This option should be selected for projects where the sign would be near a major road or thoroughfare or where the facility is in a location at which this would effectively publicize the upgrades. Some facilities will not find this an appropriate or cost-effective solution. For example, investing in a large road sign for a facility that is located in a rural area or where access is limited to a smaller service road would likely not be an optimal solution.

Signs can also be located away from the project site if there is another reasonable alternative. For example, a community may elect to place a sign advertising the project near a body of water that receives discharge from a particular facility.

States selecting projects that will implement this requirement through use of a traditional sign should ensure the following are included:

- The name of the facility, project and community
- Project cost
- The State Agency/SRF administering the program
- The EPA and State Agency logos (EPA logo may only be used on a sign)

If the EPA logo is displayed along with logos of other participating entities, the EPA logo must not be displayed in a manner that implies that EPA itself is conducting the project. Instead, the EPA logo must be accompanied with a statement indicating that the recipient received financial assistance from EPA for the project. As provided in the sign specifications from the EPA Office of Public Affairs (OPA), the EPA logo is the identifier for assistance agreement projects. States are required to ensure that recipients comply with the sign specifications provided by the OPA, available at http://www.epa.gov/ogd/tc/epa_logo_seal_specifications_for_infrastructure_grants.pdf. To obtain the appropriate EPA logo graphic file, the recipient should send a request directly to OPA and include the EPA Project Officer in the communication.

Implementation Option: Posters or Brochures

Smaller projects, projects located in rural areas, and other efforts may find that it is more cost-effective and practical to advertise efforts through creation of a poster or smaller sign. If the project involves nonpoint source or green infrastructure components, those can be described at the discretion of the state or community.

The poster or brochure and acknowledgement should be visible, as well as a website or other source of information for individuals that may be curious about the SRF program. The community could also implement this option as a short pamphlet or brochure that is placed in one of these locations for community members to read.

Posters or brochures should be placed in a public location that is accessible to a wide audience of community members. This can include, but is not limited to:

- Town or City Hall
- Community Center
- Locally owned or operated park or recreational facility
- Public Library
- County/municipal government facilities
- Court house or other public meeting space

Given the low cost for producing multiple copies of the same poster, pamphlet, or brochure, communities can explore options for displaying these posters in several locations simultaneously. This would achieve the overall objective of reaching a broad audience and publicizing the project.

States have the option of creating a template verbiage and layout to provide to borrowers, particularly smaller or disadvantaged communities. This could reduce the burden on small municipalities which may or may not have the staffing capacity to meet signage requirements on their own.

States selecting projects that will implement this requirement through use of posters or brochures should ensure the following are included:

- Name of facility, project and community
- State SRF administering the program
- Project is wholly or partially funded with EPA funding
- Brief description of project
- Brief description of the water quality benefits the project will achieve

Implementation Option: Newsletter, Periodical or Press Release

For communities where there is no suitable public space or where advertisement through signage is unlikely to reach community members effectively, projects can be advertised in a community newsletter or similar periodical. States can use guidelines from their standard public notice practices. For new construction, if a groundbreaking ceremony is to be held, an announcement could publicize or accompany publicity for this event.

In some cases, it may be appropriate for the state agency to issue a formal press release announcing construction of a new facility. Distributing a single prepared statement concisely summarizing the project purpose and the joint funding from EPA and state resources can reach a wide audience as the statement goes through multiple news outlets. Programs should consider whether or not this is an option that is likely to effectively publicize the CWSRF or DWSRF program in local news sources.

If a recipient decides on a public or media event to publicize the accomplishment of significant events related to construction as a result of EPA support, EPA must be provided with at least a ten working day notice of the event and provided the opportunity to attend and participate in the event.

States selecting projects that will implement this requirement through use of a newsletter, periodical or press release should ensure the following are included:

- Name of facility, project and community
- State SRF administering the program

- Project is wholly or partially funded with EPA funding
- Brief description of the project
- Brief listing of water quality benefits to be achieved

Implementation Option: Insert or Pamphlet in Water/Sewer Bill

Utilities can consider including a single-page insert within water and sewer bills that are mailed to residents and users in the area. This approach would effectively publicize the project to those individuals directly benefitting from the project. The flyer or insert could emphasize the interest rate and financial savings that the community achieved by taking advantage of SRF funds as well as the environmental and public health benefits to the community.

States selecting projects that will implement this requirement through use of an insert or pamphlet in water/sewer bill should ensure the following are included:

- Name of facility, project and community
- State SRF administering the program
- Project is wholly or partially funded with EPA funding
- Brief description of the project
- Brief listing of water quality benefits to be achieved

Implementation Option: Online & Social Media Publicity

Many communities are increasingly finding that the online forum is the most cost-effective approach to publicizing their SRF programs and reaching a broad audience of stakeholders. Online “signage” should follow the minimum information guidelines above and may appear on the town, community or facility website if available. In some cases, communities may be active on social media sites such as Facebook or Twitter. These can be used as an opportunity for publicizing projects and information about how SRF funds are being used in the community. These online announcements/notices may be appropriate for settings where physical signage would not be visible to a wide audience. They can be a more cost-effective option than traditional signs or publicity in print media outlets. This option may be most useful where the community’s website is a well-recognized source of information for its residents.

In the case of some projects, such as nonpoint source or sponsorship projects, there might be additional opportunities for online publicity through partner agencies or organizations. This could take place either on the organization’s website or again through social media outlets.

States selecting projects that will implement this requirement through use of online & social media publicity should ensure the following are included:

- Name of facility, project and community
- State SRF administering the program
- Project was wholly or partially funded with EPA funding
- Brief description of the project

- Brief listing of water quality benefits to be achieved

Suggested Language for Alternate Options

For any of the alternate implementation options listed above, SRF programs have discretion to structure their signage as they see appropriate. The language below is offered as an option for use in posters, pamphlets, brochures, press releases, or online materials. States may consider using the following:

“Construction of upgrades and improvements to the [Name of Facility, Project Location, or WWTP] were financed by the [Clean Water/Drinking Water] State Revolving Fund. The [CWSRF/DWSRF] program is administered by [State Agency] with joint funding from the U.S. Environmental Protection Agency and [State Name]. This project will (description of project) and will provide water quality benefits [details specifying particular benefits] for community residents and businesses in and near [name of town, city, and/or water body or watershed to benefit from project.] [CWSRF/DWSRF] programs operate around the country to provide states and communities the resources necessary to maintain and improve the infrastructure that protects our valuable water resources nationwide. “

For projects in certain areas, states should consider whether or not it is appropriate to include additional details about the projects. Specific benefits, such as reduction of CSO events, lessening of nutrient pollution, reducing contaminant levels or water pumping costs, or improvements to a particular water body, may be of interest to community residents. In these cases, including them would further serve to showcase positive efforts financed by the SRF programs. Additionally, for projects with components that meet Green Project Reserve (GPR) criteria, States may elect to detail these particular improvements. For example, the state could include quantitative improvements in energy efficiency or water conservation achieved by project upgrades. If the project includes green infrastructure components such as rain gardens and green roofs that have environmental and aesthetic benefits to the community, these can be described briefly as well. Again, this additional information can be included at the discretion of the state when it is appropriate, given the project type, location, and the type of signage or publicity effort selected.

SECTION 017100

FINAL CLEANING

PART 1 – GENERAL

1.1 GENERAL

- A. Execute cleaning, during progress of the Work, at completion of the Work, and as required by General and Supplementary Conditions, including Supplemental General Conditions SRF.
- B. Requirements of Regulatory Agencies:
 - 1. In addition to the requirements herein, maintain the cleanliness of the Work and surrounding premises within the Work limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes and regulations.
 - 2. Comply with all federal, state and local antipollution laws, ordinances, codes and regulations when disposing of waste materials, debris and rubbish.
- C. Scheduling of Cleaning and Disposal Operations:
 - 1. So that dust, wash water or other contaminants generated during such operations do not damage or mar painted or finished surfaces.
 - 2. To prevent accumulation of dust, dirt, debris, rubbish and waste materials on or within the Work or on the premises surrounding the Work.
- D. Waste Disposal:
 - 1. Properly dispose of all waste materials, surplus materials, debris and rubbish off the plant site.
 - 2. Do not burn or bury rubbish and waste materials on the plant site.
 - 3. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 4. Do not discharge wastes into streams, creeks, or waterways.
- E. Cleaning Materials:
 - 1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
 - 2. Use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.
 - 3. Use only materials which will not create hazards to health or property.

- F. During Construction:
1. Keep the Work and surrounding premises within Work limits free of accumulations of dirt, dust, waste materials, debris and rubbish.
 2. For outside work and storage areas, keep dust generating areas wetted down.
 3. Provide suitable containers for storage of waste materials, debris and rubbish until time of disposal.
 4. Dispose of waste, debris and rubbish off site at legal disposal areas.
- G. When Work is complete:
1. Remove and properly dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.
 2. Repair pavement, roads, sod, and all other areas damaged as a result of the construction related activities and restore them to, or near, original condition, as accepted by the Owner and Engineer.
 3. Remove spatter, grease, stains, fingerprints, dirt, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering.
 4. Repair, patch and touch up chipped, scratched, dented or otherwise marred surfaces to match specified finish.
 5. Clean all floors, slabs, pavements, and ground surfaces.
 6. Maintain cleaning until acceptance and occupation by Owner.

PART 2 – PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

****END OF SECTION****

SECTION 017200

RECORD DOCUMENTS

PART 1 – GENERAL

1.1 GENERAL

- A. The Contractor shall maintain and provide the Engineer with as-built and Work documents as specified below except where otherwise specified or modified in Specifications.
- B. Maintenance of Documents:
 - 1. Maintain in Contractor's field office or work area in clean, dry, legible condition complete sets of the following: drawings, specifications, addenda, approved shop drawings, samples, photographs, change orders, other modifications of contract, test records, survey data, field orders, records of installed quantities of materials, and all other documents pertinent to Contractor's Work.
 - 2. Make documents available at all times for inspection by Owner and Engineer.
 - 3. Upon inspection, if it is determined, by the Owner or Engineer, that record documents are not being maintained properly, the Owner may elect to withhold payments to Contractor until as-built and Work documents are up-to-date and organized.
 - 4. As-built documents shall not be used for any other purpose and shall not be removed from the office without approval by the Owner and Engineer.
- C. Marking System: Provide colored pencils for marking changes, revisions, additions and deletions, to the record set of Drawings. Use following color code unless otherwise approved by the Engineer.
 - 1. General and Process: Red
 - 2. Architectural: Blue
 - 3. Structural: Purple
 - 4. Plumbing: Brown
 - 5. Mechanical and HVAC: Green
 - 6. Electrical and Instrumentation: Orange
 - 7. Other Printed Notations: Black
- D. Recording:
 - 1. Label each document "AS-BUILT" in 2-inch high printed letters.
 - 2. Keep as-built and Work documents current.
 - 3. Do not permanently conceal any Work until required information has been recorded.
 - 4. Drawings: Legibly mark to record actual construction including:

- a. Depths of various elements of foundation in relation to datum.
 - b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - c. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - d. Field changes of dimensions and details.
 - e. Changes made by Change Order or Requests for Information (RFIs).
 - f. Details not on original Contract Drawings.
 - 5. Specifications and Addenda: Legibly mark up each Section to record:
 - a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - b. Changes made by Change Order or Requests for Information (RFIs).
 - c. Other matters not originally specified.
- E. Monthly Status Review:
- 1. Prior to recommending monthly progress payments to the Owner, the Engineer may review the status of the Contractor's record documents. Review may include verification of the timelines, accuracy, and neatness of the modifications.
 - 2. Record documents found not up-to-date or usable in any manner may be the basis for recommending a reduction in the periodic payment or delay in processing the payment application until the work is corrected.
 - 3. The monthly review does not relieve the Contractor of their responsibilities under this section to provide a complete accurate as-built and Work documents at the end of the work.
- F. Submittals:
- 1. At completion of Work, deliver hard copies of approved submittals to the Owner, through the Engineer, in addition to the O&M manuals furnished.
 - 2. Accompany submittals with a transmittal letter containing:
 - a. Date.
 - b. Contract number.
 - c. Title and number.
 - d. Contractor's name and address.
 - e. Title and number of each record document.
 - f. Certification that each document as submitted is complete and accurate.
 - g. Signature of Contractor or an authorized representative.
 - 3. Final payment will not be made until hard copies of all approved submittals are provided.

G. Panelboard Schedules:

1. At completion of Work, Contractor shall furnish and place new schedules for all panelboards, power and signal, that required updates as a result of the work performed.
2. Review with Owner, and make any revisions requested, for acceptance.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

****END OF SECTION****

SECTION 031000

CONCRETE FORMING AND ACCESSORIES

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

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. Form-facing material for cast-in-place concrete.

1.3 DEFINITIONS

- A. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction, movement, contraction, and isolation joints
 - c. Forms and form-removal limitations.
 - d. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Exposed surface form-facing material.
 - 2. Concealed surface form-facing material.
 - 3. Form ties.
 - 4. Waterstops.
 - 5. Form-release agent.

SECTION 031000

CONCRETE FORMING AND ACCESSORIES

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing and inspection agency.
- B. Field quality-control reports.
- C. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 - 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
- B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
 - 1. Provide continuous, true, and smooth concrete surfaces.
 - 2. Furnish in largest practicable sizes to minimize number of joints.
 - 3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

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CONCRETE FORMING AND ACCESSORIES

- 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.4 RELATED MATERIALS

- A. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- B. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:

SECTION 031000

CONCRETE FORMING AND ACCESSORIES

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
1. Minimize joints.
 2. Exposed Concrete: Symmetrically align joints in forms.
- DI. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- DII. Do not use rust-stained, steel, form-facing material.
- DIII. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
1. Provide and secure units to support screed strips
 2. Use strike-off templates or compacting-type screeds.
- DIV. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 2. Locate temporary openings in forms at inconspicuous locations.
- DV. Chamfer exterior corners and edges of permanently exposed concrete.
- DVI. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- DVII. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
1. Determine sizes and locations from trades providing such items.
 2. Obtain written approval of Engineer prior to forming openings not indicated on Drawings.
- DVIII. Construction and Movement Joints:
1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 3. Place joints perpendicular to main reinforcement.

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CONCRETE FORMING AND ACCESSORIES

- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
 - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 - 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 3. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.
 - 1. Install in longest lengths practicable.
 - 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 - 3. Protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

- A. Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations. Curing and protection operations need to be maintained at unformed surfaces and applied at formed surfaces immediately after removal of forms, for the remainder of the curing period.

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CONCRETE FORMING AND ACCESSORIES

- B. Clean and repair surfaces of forms to be reused in the Work.
 - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 - 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
 - 1. Align and secure joints to avoid offsets.
 - 2. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.5 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports. Special Inspections shall be in accordance with Section 1705.3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.
- B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

SECTION 032000

CONCRETE REINFORCING

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. Steel reinforcement bars.
 - 2. Welded-wire reinforcement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of steel reinforcement.
 - 2. Bar supports.
- B. Shop Drawings: Comply with ACI SP-066:
 - 1. Include placing drawings that detail fabrication, bending, and placement.
 - 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 - 1. Location of construction joints is subject to approval of the Engineer.

SECTION 032000

CONCRETE REINFORCING

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
 - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M
- B. Material Certificates: For each of the following, signed by manufacturers:
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:
- D. Field quality-control reports.
- E. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - 1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
 - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

SECTION 032000

CONCRETE REINFORCING

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- B. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; tension-compression type
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.

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CONCRETE REINFORCING

- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Stagger splices in accordance with ACI 318.
 - 2. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports. Special Inspections shall be in accordance with Section 1705.3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.
- B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:

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1. Steel-reinforcement placement.
- D. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

END OF SECTION 032000

SECTION 033000

CAST-IN-PLACE CONCRETE

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. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

- B. Related Requirements:

- 1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
 - 2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.

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2. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction joints, control joints, isolation joints, and joint-filler strips.
 - c. Anchor rod and anchorage device installation tolerances.
 - d. Cold and hot weather concreting procedures.
 - e. Concrete finishes and finishing.
 - f. Curing procedures.
 - g. Forms and form-removal limitations.
 - h. Floor and slab flatness and levelness measurements.
 - i. Concrete repair procedures.
 - j. Concrete protection.
 - k. Initial curing of test cylinders (ASTM C31/C31M.)

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures:
6. Joint fillers.
7. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
 - a. Amount of mixing water withheld and allowed to be added at project site is required to be included on the delivery ticket.
9. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

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- C. Shop Drawings:
- D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
 - 1. Concrete Class designation.
 - 2. Location within Project.
 - 3. Exposure Class designation.
 - 4. Formed Surface Finish designation and final finish.
 - 5. Final finish for floors.
 - 6. Curing process.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer: Include copies of applicable ACI certificates.
 - 2. Ready-mixed concrete manufacturer.
 - 3. Testing agency: Include copies of applicable ACI certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Curing compounds.
 - 4. Bonding agents.
 - 5. Adhesives.
 - 6. Vapor retarders.
 - 7. Joint-filler strips.
 - 8. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Portland cement.
 - 2. Fly ash.
 - 3. Slag cement.
 - 4. Blended hydraulic cement.
 - 5. Silica fume.
 - 6. Performance-based hydraulic cement.
 - 7. Aggregates.
 - 8. Admixtures:
- D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.
- E. Research Reports:

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1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
- F. Preconstruction Test Reports: For each mix design.
- G. Field quality-control reports.
- H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- C. Field Quality Control Testing Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Water-Cement ratio.
 - e. Seven-day compressive strength.
 - f. 28-day compressive strength.

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- g. Standard deviation.
- h. ACI required compressive strength

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

- 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- 2. When average high and low temperature is expected to fall below 40 deg F, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
- 3. Do not use frozen materials or materials containing ice or snow.
- 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
- 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

- 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
- 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
 - a. Maintain forms, steel reinforcement, embedded items, and subgrade temperature less than 115 deg F.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Source Limitations:

- 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.

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2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
 3. Obtain aggregate from single source.
 4. Obtain each type of admixture from single source from single manufacturer.
- B. Cementitious Materials:
1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
 2. Fly Ash: ASTM C618, Class C or F.
 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
- C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
 2. Maximum Coarse-Aggregate Size: 1 inch nominal.
 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride [in steel-reinforced concrete].
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

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2.3 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
- D. Curing Paper: Eight-feet- wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- E. Water: Potable or complying with ASTM C1602/C1602M.
- F. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.4 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
 - 1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Floor Slab Protective Covering: Eight-feet- wide cellulose fabric.

2.5 REPAIR MATERIALS

- A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

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3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.6 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 2. Slag Cement: 50 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete and concrete with a w/cm below 0.50.

2.7 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete.
 1. Minimum Compressive Strength: As indicated at 28 days.
 2. Slump Limit: 5 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site
 3. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 4. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

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2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 - 1. Daily access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 - 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

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1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Engineer.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items, is complete and that required inspections are completed.
- B. Notify Engineer and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

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- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3.7 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:
 - 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces [not exposed to public view] <Insert locations>.
 - 2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view

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3. ACI 301 Surface Finish SF-3.0:

- a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
- b. Remove projections larger than 1/8 inch.
- c. Patch tie holes.
- d. Surface Tolerance: ACI 117 Class A.
- e. Locations: Apply to concrete surfaces[exposed to public view.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.
4. Apply float finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system when the total air content of concrete exceeds 3 percent.
 - a. Coordinate required final finish with Engineer before application.
 - b. Comply with flatness and levelness tolerances for trowel-finished floors.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.

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6. Apply a trowel finish to surfaces exposed to view, where the total air content of concrete is less than 3 percent.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not 1/8 inch.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
5. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 CONCRETE CURING

- #### A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

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1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces
 - a. Curing Period: 10 days.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
 - a. Curing Period: 10 days typical, 28 days for surfaces to receive a polished concrete finish
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12-inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

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- 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Curing Compound:
- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.11 TOLERANCES

- A. Conform to ACI 117.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:

1. Repair and patch defective areas when approved by Engineer.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

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1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

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6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
 - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.13 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports. Special Inspections shall be in accordance with Section 1705.3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.
- B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Special Inspector shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 2. Special Inspector shall immediately report to Engineer, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Special Inspector shall report results of tests and inspections, in writing, to Owner, Engineer, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

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- a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
 1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Engineer.
 7. Post-installed anchors in hardened concrete.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

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- a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure six 6-inch by 12-inch or 4-inch by 8-inch standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of three laboratory-cured specimens at seven days and one set of three specimens at 28 days. Maintain remainder of specimens in reserve for later testing if required.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
9. Additional Tests:
 - a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

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- b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Engineer.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
 - 10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - 11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 > hours of completion of floor finishing and promptly report test results to Engineer.

3.14 PROTECTION

- A. Protect concrete surfaces as follows:
- 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.
 - 3. Prohibit vehicles from interior concrete slabs.
 - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 - 5. Prohibit placement of steel items on concrete surfaces.
 - 6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 033000

SECTION 078410

FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes firestopping for the following:
 - 1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 3. Sealant joints in fire-resistance-rated construction.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
 - 1. Where firestop systems protect penetrations located outside of wall cavities.
 - 2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
 - 3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.

4. Where firestop systems protect penetrating items larger than a 100 mm diameter nominal pipe or 100 sq. cm in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
- F. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
- G. For floor penetrations with annular spaces exceeding 100 mm or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
- H. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- I. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
 1. Product data for each type of product specified.
 2. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
 3. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
 4. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
 5. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.
 6. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

7. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
8. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 2.5 Pa is maintained at a distance of 20 mm below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
- B. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 2.5 Pa, as measured 20 mm from the face exposed to furnace fire. Provide systems complying with the following requirements:
 1. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 2. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- C. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.

- D. Installer Qualifications: Engage an experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.
- E. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- F. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- G. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements"

article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation.
 - b. Ceramic fiber.
 - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - d. Fire-rated formboard.
 - e. Joint fillers for joint sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.
- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.
- B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.
- C. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- D. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- E. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
- H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogenous mortar.

- I. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
 - 2. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:
 - a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
 - 3. Available Products: Contractor shall furnish and install products indicated herein or the most current version of the product or an approved equal. Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 4. Ceramic-Fiber and Mastic Coating:
 - a. FireMaster Bulk and FireMaster Mastic, Thermal Ceramics.
 - 5. Ceramic-Fiber Sealant:
 - a. Metacaulk 525, The RectorSeal Corporation.
 - 6. Endothermic, Latex Sealant:
 - a. Fyre-Shield, Tremco Inc.
 - 7. Endothermic, Latex Compounds:
 - a. Flame-Safe FS500/600 Series, International Protective Coatings Corp.
 - b. Flame-Safe FS900/FST900 Series, International Protective Coatings Corp.
 - 8. Intumescent Latex Sealant:
 - a. Metacaulk 950, The RectorSeal Corporation.
 - b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.
 - 9. Intumescent Putty:
 - a. Pensil 500 Intumescent Putty, General Electric Co.
 - b. Flame-Safe FSP1000 Putty, International Protective Coatings Corp.
 - c. Fire Barrier Moldable Putty, 3M Fire Protection Products.

10. Intumescent Wrap Strips:
 - a. Dow Corning Fire Stop Intumescent Wrap Strip 2002, Dow Corning Corp.
 - b. CS2420 Intumescent Wrap, Hilti Construction Chemicals, Inc.
 - c. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
11. Job-Mixed Vinyl Compound:
 - a. USG Firecode Compound, United States Gypsum Co.
12. Mortar:
 - a. K-2 Firestop Mortar, Bio Fireshield, Inc.
 - b. Novasit K-10 Firestop Mortar, Bio Fireshield, Inc.
 - c. KBS-Mortar Seal, International Protective Coatings Corp.
13. Pillows/Bags:
 - a. Firestop Pillows, Bio Fireshield, Inc.
 - b. KBS Sealbags, International Protective Coatings Corp.
14. Silicone Foams:
 - a. Dow Corning Fire Stop Foam 2001, Dow Corning Corp.
 - b. Pensil 200 Foam, General Electric Co.
15. Silicone Sealants:
 - a. Dow Corning Firestop Sealant 2000, Dow Corning Corp.
 - b. Dow Corning Firestop Sealant SL 2003, Dow Corning Corp.
 - c. Pensil 100 Firestop Sealant, General Electric Co.
 - d. CS240 Firestop Sealant, Hilti Construction Chemicals, Inc.
 - e. Metacaulk 835, The RectorSeal Corporation.
 - f. Metacaulk 880, The RectorSeal Corporation.
 - g. Fyre-Sil, Tremco Inc.
 - h. Fyre-Sil S/L, Tremco Inc.
16. Solvent-Release-Curing Intumescent Sealants:
 - a. Biostop 500 Intumescent Firestop Caulk, Bio Fireshield, Inc.
 - b. Fire Barrier CP 25N/S Caulk, 3M Fire Protection Products.
 - c. Fire Barrier CP 25S/L Caulk, 3M Fire Protection Products.

2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
- B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
 1. Colors shall match to greatest extent possible existing sealants within the facility.
 2. Owner will provide final selections based manufacturer's full range of standard colors for products of type indicated.

- C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
- D. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
 - 1. 50 percent movement in both extension and compression for a total of 100 percent movement.
 - 2. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
- E. Multicomponent, Non-sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
- F. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
 - 1. 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement.
 - 2. 50 percent movement in both extension and compression for a total of 100 percent movement.
- G. Single-Component, Non-sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.
- H. Available Products: Contractor shall furnish and install products indicated herein or the most current version of the product or an approved equal. Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Single-Component, Neutral-Curing, Silicone Sealant:
 - a. Dow Corning 790, Dow Corning Corp.
 - b. Dow Corning 795, Dow Corning Corp.
 - c. Silpruf, General Electric Co.
 - d. Ultraglaze, General Electric Co.
 - e. 864, Pecora Corp.
 - 2. Multicomponent, Nonsag, Urethane Sealant:
 - a. Vulkem 922, Mameco International Inc.
 - b. Dynflex, Pecora Corp.
 - c. Dynatred, Pecora Corp.
 - d. Dynatrol II, Pecora Corp.
 - e. Sikaflex 2cn NS, Sika Corp.

- f. Sonolastic NP 2, Sonneborn Building Products Div., ChemRex Inc.
 - g. Dymeric, Tremco Inc.
 - 3. Single-Component, Nonsag, Urethane Sealant:
 - a. Isoflex 880 GB, Harry S. Peterson Co., Inc.
 - b. Isoflex 881, Harry S. Peterson Co., Inc.
 - c. Vulkem 921, Mameco International Inc.
 - d. Sikaflex--15LM, Sika Corp.

2.4 PERIMETER FIRE-CONTAINMENT SYSTEMS

- A. Where UL-classified perimeter fire-containment systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Perimeter Fire-Containment System
 - 1. UL-Classified System No. FWD1003
 - 2. Integrity Rating: 2 hours.
 - 3. Insulation Rating: 1 hour.
 - 4. Linear Opening Width: 3", maximum.

2.5 MIXING

- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.
4. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
5. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

* * END OF SECTION * *

SECTION 079200

JOINT SEALANTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:
- B. This Section includes sealants for the following applications:
 - 1. Elastomeric Sealant

1.2 SUBMITTALS

- A. Provide for Owner and Engineer review and approval in accordance with Section 013000.
- B. Product Data: For each joint-sealant product proposed for use in this project.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Joint Sealant Schedule: Include the following information:
 - 1. Joint sealant application, joint location, and designation.
 - 2. Joint sealant manufacturer and product name.
 - 3. Joint sealant formulation.
 - 4. Joint sealant color.
- E. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of A/E's and owners, and other information specified.
- F. Sample warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

- B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.
- C. Pre-Construction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:
 - 1. Locate test joints where indicated or, if not indicated, as directed by Owner and Engineer.
 - 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 - 3. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
 - 4. Test Method: Test joint sealants by hand-pull method described below:
 - a. Install joint sealants in 60 inch long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
 - b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2 inch piece.
 - c. Use fingers to grasp 2 inch piece of sealant between cross-cut end and 1 inch mark; pull firmly at a 90 degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 - d. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
 - 5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
 - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

- B. Colors of Exposed Joint Sealants: As selected by Owner and Engineer from manufacturer's full range for this characteristic.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant including those referencing ASTM C920 classifications for type, grade, class, and uses.
- B. Additional Movement Capability: Where additional movement capability is specified, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C920 for uses indicated.
- C. Stain-Test-Response Characteristics: Where elastomeric sealants are to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for project.
- D. Polyurethane Sealant: Two component polyurethane joint sealant, gun grade, non-sag consistency, conforming to ASTM C920, Type M, Grade NS, Class 25 to $\pm 50\%$ maximum movement capacity per ASTM C719, use T (traffic) and NT (non-traffic).
- E. Expansion Joint Sealant:
 - 1. Two part self leveling compound conforming to ASTM C920, Type M, Grade P, Class 25 $\pm 25\%$ maximum movement capacity per ASTM C719, use T (traffic) and NT (non-traffic).
 - 2. Color: As selected from manufacturer's full range.
- G. Available Products: Subject to compliance with requirements. Elastomeric sealants that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Polyurethane Sealant
 - a. "Dyanrol II", Pecora Corp.
 - b. "Sikaflex-2C NS", Sika Corp.
 - c. "Dymeric Plus", Tremco, Inc.
 - 2. Expansion Joint Sealant
 - a. "NR-200 Urexpan", Pecora Corp.
 - b. "Sikaflex-2C SL", Sika Corp.

2.3 SOLVENT-RELEASE JOINT SEALANTS

- A. Acrylic Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing, acrylic terpolymer sealant complying with AAMNA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for project without failing cohesively:
 - 1. 7-1/2% movement in both extension and compression for a total of 15%.

- B. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for joints 3/16 inch or smaller in width.
 - 1. Acrylic Sealant
 - a. "60+ Unicrylic", Pecora Corp.
 - b. "PTI 738", Protective Treatments, Inc.
 - c. "Mono", Tremco, Inc.
 - d. or approved equal.
 - 2. Pigmented Narrow Joint Sealant
 - a. "PTI 738", Protective Treatments, Inc.
 - b. or approved equal.

2.4 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Non-porous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent non-porous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

- D. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include, but are not limited to the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Similar porous joint surfaces.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean non-porous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Non-porous surfaces include, but are not limited to the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
 - e. Other non-porous surfaces.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written

instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.
 - 4. Provide flush joint configuration, per Figure 5B in ASTM C1193, where indicated.
 - 5. Provide recessed joint configuration, per Figure 5C in ASTM C1193, of recess depth and at locations indicated.

- a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

* * END OF SECTION * *

SECTION 081100

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to Plans for additional information and details related to door systems to be furnished and installed as well as Section 087100 (Door Hardware).
- B. To the greatest extent possible, Contractor shall furnish and install door systems, including hardware, that matches the existing doors in the Chemical Building.

1.2 SUMMARY

- A. Related Specification Sections:
 - 1. Section 087100, Door Hardware
 - 2. Section 099000, Paintings and Coatings
- B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
 - 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
 - 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
 - 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
 - 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
 - 10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
 - 11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.

12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
14. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
15. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Provide for Owner and Engineer review and approval in accordance with Section 013000.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- C. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- D. Shop Drawings: Shall include, but not limited to, the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
- E. Samples for Verification: Samples are only required by request of the Owner and Engineer and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40 inches above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4 inch high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4 inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Contractor shall verify actual dimensions of openings by field measurements before ordering and fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CECO Door Products.
 - 2. Curries Company.
 - 3. Steelcraft.
 - 4. or approved equal.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
- B. Interior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 - 4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 - 5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A653/A653M, Coating Designation A60.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames, with the exception of slip-on drywall types, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
 - 3. Frames for Steel Doors: Minimum 16 gauge (0.053 inch / 1.3mm) thick steel sheet.
 - 4. Frames for openings up to 48 inches in width: Minimum 16 gauge (0.053 inch / 1.3 mm) thick steel sheet.
 - 5. Frames for openings 48 inches and wider in width: Minimum 14 gauge (0.067 inch / 1.7 mm) thick steel sheet.
- C. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick. For existing openings, use punch and dimple soffits on vertical jambs for a 3/8 inch flat head expansion bolt. Flat head bolt must lay flat to soffit of frame when installed. Fill with auto body putty flush with frame. Use appropriate anchor inside frame to support soffit and weld to frame. Install bolts per manufacturer instructions.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.7 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Astragals: Provide overlapping astragals as noted in door hardware sets in Section 08711 on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 - 2. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Section 08711.
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 - 3. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48 inches and wider with mortise butt type hinges at top hinge locations.
 - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Section 08711.
 - 5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 - 6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 - 7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 8. Jamb Anchors: Provide number and spacing of anchors as follows:

- a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- 9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Section 08711.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 08711.
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

2.8 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

* * END OF SECTION * *

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.1 OVERVIEW

- A. Refer to Plans for additional information and details related to door systems to be furnished and installed as well as Section 081100 (Hollow Metal Doors and Frames).
- B. To the greatest extent possible, Contractor shall furnish and install door systems, including hardware, that matches the existing doors in the Chemical Building.

1.2 SUBMITTALS

- A. Provide for Owner and Engineer review and approval in accordance with Section 013000.
- B. Product Data: Manufacturer's product data sheets including installation details and instructions, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with approved doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.

- D. Samples: If requested by Owner and Engineer, Contractor shall be prepared to furnish samples of door hardware options and available finishes for Owner selection of hardware to be furnished and installed.
- E. Operating and Maintenance Manuals: In accordance with Section 013000, provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation.
 - 1. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives.
 - 2. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance
 - 3. Furnish two (2) hard copies and an electronic file (PDF/Word) of the O&M manuals.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work.
- D. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.
- E. Regulatory Requirements: Comply with NFPA 80 and NFPA 101 requirements and guidelines as directed in the model building code including, but not limited to, the following:
 - 1. NFPA 101: Comply with the following for means of egress doors:

- a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - 2. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40 inches above sill) or UL-10C.
 - a. Test Pressure: Positive pressure labeling.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
 - 1. Deliver products in original, unopened packaging with legible manufacturer's identifications.
 - 2. Package hardware to prevent damage during and transit and storage.
 - 3. Mark hardware to correspond with approved hardware schedule, including Owner selected colors and finishes.
- B. Storage and Protection: Comply with manufacturer's recommendations.

1.5 COORDINATION

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.6 WARRANTY

- A. General Warranty: Reference Division 1, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Warranty (minimum):
 - 1. Closers: Ten (10) years.

2. Exit Devices: Five (5) years.
3. Locksets and Cylinders: Three (3) years.
4. All other hardware: Two (2) years.

1.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General:
 1. Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
 2. The new door hardware shall be similar to the existing hardware associated with the interior door for Room 105 (labeled 'Dry Chemical Room' prior to work).

2.2 HINGES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
 1. Acceptable Manufacturers:
 - a. Hager Companies (HA).
 - b. McKinney Products (MK).
 - c. Stanley Hardware (ST).
 - d. or approved equal.
- B. Standards: Comply with the following:
 1. Butts and Hinges: BHMA A156.1.
 2. Template Hinge Dimensions: BHMA A156.7.
 3. Pivots: BHMA A156.4.
- C. Quantity: Three (3) hinges for doors with heights 61 to 90 inches.
- D. Size:

Maximum Door Size inches	Hinge Height inches	Metal Thickness inches	
		Standard Weight	Heavy Weight
36 by 84 by 1-3/4	4-1/2	0.134	0.180

- E. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

- F. Hinge Weight: Interior Doors shall be antifriction-bearing hinges.
- G. Hinge Base Metal: Hinges for fire-rated assemblies shall be stainless steel with stainless-steel pin.
- H. Fasteners:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors. Finish screw heads to match surface of hinges.

2.3 EXIT DEVICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
 - 2. Von Duprin; an Ingersoll-Rand Company (VD).
 - 3. Yale Security Inc.; Div. of Williams Holdings (YAL).
 - 4. or approved equal.
- B. Standard: BHMA A156.3, Grade 1.
- C. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 1. Operation: Rigid.
- G. Outside Trim: Lever with cylinder; material and finish to match existing door systems.
- H. Through Bolts: For exit devices and trim on metal doors.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts: ANSI/BHMA A156.16, Grade 1, manual flush bolts. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 1. Acceptable Manufacturers:
 - a. Door Controls International (DC).

- b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).
 - d. or approved equal.
- B. Dustproof Strikes: Provide manufacturer's standard dustproof strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set. Certified ANSI/BHMA 156.16.

2.5 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
 - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 - 2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Cycle Testing: Provide closers which have surpassed 10 million cycles in a test witnessed and verified by UL.
 - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 - 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
 - b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
 - c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
 - d. Closers shall not be installed on corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.
 - 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.
- B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type,

one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC6000 Series.
 - b. LCN Closers (LC) - 1460FC Series.
 - c. Norton Door Controls (NO) - 8500 Series.
 - d. Sargent Manufacturing (SA) - 1431 Series.
 - e. or approved equal.

2.6 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following.
 - a. Stainless Steel: 0.050 inch thick, with countersunk screw holes (CSK).
4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
5. Metal Door Edging: Door protection edging fabricated from a minimum 0.050 inch thick metal sheet, formed into an angle or "U" cap shapes, surface or mortised mounted onto edge of door. Provide appropriate leg overlap to account for protection plates as required. Height to be as specified in the Hardware Sets.
6. Acceptable Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).
 - d. or approved equal.

2.7 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded

bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:
 - a. Rixson Door Controls (RF).
 - b. Sargent Manufacturing (SA).
 - c. or approved equal.

2.8 ARCHITECTURAL SEALS

- A. General: Weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide smoke, light, or sound gasketing on interior doors where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
 1. Pemko Manufacturing (PE).
 2. Reese Enterprises, Inc. (RS).
 3. Zero International (ZE).
 4. or approved equal.

2.9 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.10 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify Owner and Engineer of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

3. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the Owner and Engineer. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Owner and Engineer with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

Hardware Schedule

Hardware Set No. 1 – Single H.M. Door and H.M. Frame (Door 106A)

Hinges
Surface Closer
Kick Plates (interior/exterior)
Astragal
Weather-Stripping
Dust-Proof Strike
Door Sweep
Push-Bar Exit Device (interior) with Lever Handle (exterior)

Hardware Set No. 2 – Pair H.M. Doors and H.M. Frame (Door 106B)

Hinges
Astragal
Weather-Stripping
Dust-Proof Strike
Door Sweep (both door leaves)
Surface Closer (active door leaf)
Surface Overhead Holder (inactive door leaf)
Kick Plates (both door leaves, exterior only)
Lever Handle (active door leaf)
Overhead Flush Bolt (inactive door leaf)

For Door 106B: Active door leaf is the left side when facing the doors from outside the room.

* * END OF SECTION * *

SECTION 099000

PAINTINGS AND COATINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
1. Contractor shall provide all labor, materials, equipment and incidentals required to furnish painting as shown and specified.
 2. The extent of painting Work is herein specified.
 3. The Work includes the painting and finishing of all items and surfaces furnished and installed under the project, and all surfaces abraded or otherwise damaged due to the Work performed under this project.
 - a. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under this and other sections of the Work.
 - b. Included but not limited to is the painting of the following:
 - 1) All piping and valves.
 - 2) Exposed electrical conduits, fittings, and supports.
 - 3) Electrical panels and equipment.
 - 4) CMU block (interior, outside walls)
 - 5) Concrete surfaces to be used as spill containment areas.
 4. The term "paint" as used herein means all painting systems materials, which includes pretreatments, primers, emulsions, enamels, stain, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
 5. Paint all exposed surfaces. The term "exposed" as used herein means all items not covered with concrete. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.
 6. Structural and miscellaneous metals covered with concrete, shall only receive a primer compatible with the covering material.
- B. General: Contractor shall match, to the greatest extent possible, new painting systems, including color options, to existing painting systems established at the treatment facilities and by the Owner.
- C. Coordination:
1. Review installation procedures under other sections and coordinate the installation of items that must be field painted in this section.
 2. Coordinate the painting of areas that are inaccessible once equipment has been installed.

3. Provide finish coats which are compatible with the prime paints used. Review other sections of these specifications to ensure compatibility of the total coatings system for the various substrates. Contractor shall be responsible for the compatibility of all shop primed and field painted items.
 4. Furnish information on the characteristics of the finish materials proposed to use, to ensure that compatibility prime coats are used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify the Engineer in writing of anticipated problems using the coating system as specified with substrates primed by others.
- C. Painting Not Included: The following categories of Work are not included as part of the field-applied finish Work, or are included in other Sections of these Specifications or in other contracts.
1. Shop Priming: Unless otherwise specified, shop priming of structural metal, miscellaneous metal fabrications, other metal items and such fabricated components as shop-fabricated or factory-built tanks, instrumentation, and electrical equipment or accessories shall conform to applicable requirements of this Section but is also included under the appropriate Sections of the Specifications.
 2. Pre-Finished Items: Unless otherwise shown or specified, do not include painting when factory finishing such as baked-on enamel, porcelain, polyvinylfluoride or other similar finish is specified for such items as, but not limited to, finished mechanical and electrical equipment. Contractor shall be required to touch up factory finished items with paint supplied by the item manufacturer. Contractor shall field paint damaged prefinished items.
 3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, bronze, copper, and similar finished materials will not require finish painting, unless shown or specified.
 - a. Moving parts of operating units, mechanical and electrical parts, such as motor shafts do not require finish painting unless otherwise specified.
 - b. Do not paint over any code-required labels, such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
 - c. Remove all paint, coating or splatter inadvertently placed on these surfaces.

1.2 QUALITY ASSURANCE

- A. Manufacturer: Provide products manufactured by one of the following:
1. Induron Protective Coatings, Birmingham, Ala. 35201
 2. Tnemec Company, Inc., Kansas City, Mo. 64120
 3. or approved equal.

- B. Source Quality Control: Obtain all materials from the same manufacturer unless otherwise approved. Obtain materials only from manufacturers who will:
 - 1. Provide the services of a qualified manufacturer's representative at the project site at the commencement of Work to advise on materials, installation and finishing techniques.
 - 2. Certify long term compatibility of all coatings with all substrates, both new and existing.
- C. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:
 - 1. OSHA 1910.144, Safety Color Code for Marking Physical Hazards.
 - 2. SSPC Volume 2, Systems and Specifications, Surface Preparation Guide and Paint Application Specifications.
- D. Definitions:
 - 1. The terms paint or painting shall in a general sense have reference to sealers, primers, oil, alkyd, latex, polyurethane, epoxy, and enamel type coatings and application of these materials.
 - 2. Dry film thickness (DFT) means the thickness, measured in mils, of a coat of paint in a cured stated. This is referenced to in this specification as dry mils.

1.3 SUBMITTALS

- A. Samples: Submit for approval the following:
 - 1. Paint samples for Engineer's review of color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Provide a listing of the material and application for each coat of each finish sample.
- B. Shop Drawings: Submit for approval the following:
 - 1. Copies of manufacturer's technical information, including paint label analysis and application instructions for each material proposed for use.
 - 2. Copies of Contractor's proposed protection procedures in each area of work.
 - 3. List each material and cross-reference to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classifications.
 - 4. Copies of manufacturer's complete color charts for each coating system.
 - 5. Maintenance Manual: Upon Completion of the Work, furnish copies of a detailed maintenance manual including the following information.
 - a. Product name and number.
 - b. Name, address and telephone number of manufacturer and local distributor.
 - c. Detailed procedures for routine maintenance and cleaning.

- d. Detailed procedures for light repairs such as dents, scratches and staining.
- C. Certificates: Submit for approval the following:
 - 1. Certificates stating that materials meet or exceed Specification requirements.
 - 2. Certificate stating that all coatings are compatible with substrate specified, and factory or field applied prime coats.
- D. Test Reports: Submit for approval certified laboratory test reports for required performance tests.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information.
 - 1. Name or title of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Manufacturer's name.
 - 4. Contents by volume, for major pigment and vehicle constituents.
 - 5. Thinning instructions where recommended.
 - 6. Application instructions.
 - 7. Comply with health and fire regulations including the Occupational Safety and Health Act of 1970.
- B. Storage of Materials:
 - 1. Store only acceptable project materials on project site.
 - 2. Store in a suitable location approved by the Engineer. Keep area clean and accessible.
 - 3. Restrict storage to paint materials and related equipment.
 - 4. Comply with Health and fire regulations including the Occupational Safety Act of 1970.

1.5 JOB CONDITIONS

- A. Existing Conditions:
 - 1. Before painting is started in any area, it shall be a broom cleaned and excessive dust shall be removed.
 - 2. After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipment.
 - 3. Before painting is started in any area, it shall be prepared in accordance with paint manufacturer's recommendation.

- B. Environmental Requirements:
1. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 55°F and 90°F unless otherwise permitted by the paint manufacturer's printed instructions.
 2. Apply other paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 65°F and 95°F, unless otherwise permitted by the paint manufacturer's printed instructions.
 3. Do not apply paint when the relative humidity exceeds 85 percent; or to damp or wet surfaces.
 4. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.
 5. Adequate illumination and ventilation shall be provided in all areas where painting operations are in progress.
- C. Protection: Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

PART 2 - PRODUCTS

2.1 MATERIAL QUALITY

- A. Provide the best grade of the various types of coatings suitable for use specified regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard best-grade product will not be acceptable.
- B. Provide primers produced by the same manufacturer as the finish coats. Use only thinners recommended by the paint manufacturer, and use only to recommended limits.
- C. Provide paints of durable and washable quality. Use materials which will withstand normal washing as required to remove grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage.

2.2 SUBSTITUTIONS

- A. No substitutions shall be considered that decrease the film thickness, the number of coats, the surface preparation or the generic type of coating specified. Approved manufacturers must furnish the same color selection as the

manufacturers specified, including accent colors in all coating system scheduled below.

2.3 COLORS AND FINISHES

- A. Surface treatments, and finishes, are shown under "Painting Systems" below. All substrates scheduled under "Painting Systems" shall be painted unless an item is specifically scheduled as not requiring the painting system scheduled below.
- B. Paint material coverage per gallon assumes a 20 percent loss.
- C. Color Selection: Contractor shall match the Owner's standard color selection schedule. Owner will make final decision on color selections.
- D. Color Coding: In general, and unless otherwise specified, all color coding of piping, ducts and equipment shall comply with applicable standards of ANSI A13.1 and OSHA 1910.144.
- E. Use representative colors when preparing samples for Owner's and Engineer's review.
- F. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated.
 - 1. Lead: Lead content shall not exceed amount permitted by federal, state and local government laws and regulations.
- G. All painting systems specified are based on brush application. Other mechanical techniques shall be submitted to the Engineer for approval before these application techniques may be utilized. Submit proof of acceptability, of technique proposed, by the paint manufacturer selected.

2.4 PAINTING SYSTEMS

- A. General: Contractor shall match, to the greatest extent possible, new painting systems, including color options, to existing painting systems established at the treatment facilities and by the Owner.
- B. Ferrous Metals and all Ferrous Piping; Interior Non-Immersion:
 - 1. Surface Preparation: SSPC-SP 6 Commercial Blast Cleaning as specified in 3.2.B. Surface preparation for shop coated surfaces per coating manufacturer recommendation.
 - 2. Product and Manufacturer: Provide one of the following:
 - a. Tnemec:
 - (1) Field Primer: Series 66 Epoxy - 1 coat, 3.0 - 5.0 mils DFT per coat, 180 - 300 square feet per gallon.

- (2) Finish: Series 66 Hi-Build Epoxoline - 2 coats, 4.0 - 6.0 mils DFT per coat, 150 - 225 square feet per gallon per coat.
 - (3) Series 161 Tnemec-Fascure may be substituted for Series 66 if approved by the coating manufacturer.
 - b. Induron:
 - (1) Field Primer: Armorguard P-14 Epoxy Primer - 1 coat, 3.0 - 5.0 mils DFT per coat, 165 - 220 square feet per gallon per coat.
 - (2) Finish: Armorguard Epoxy - 2 coats, 3.0 - 6.0 mils DFT per coat, 165 - 250 square feet per gallon per coat.
 - c. or approved equal.
- C. Carbon Steel Piping, Miscellaneous Metal; Interior Non-Immersion:
- 1. Surface Preparation: SSPC-SP6 commercial blast cleaning as specified in 3.2.B. Surface preparation for shop primed surfaces per coating manufacturer's recommendation.
 - 2. Product Manufacturer: Provide one of the following:
 - a. Tnemec:
 - (1) Field Primer: Series 66 Hi-Build Epoxoline - 1 coat, 3.0 - 5.0 mils DFT per coat, 180 - 300 square feet per gallon per coat.
 - (2) Finish: Series 66 Hi-Build Epoxoline - 2 coats, 4.0 - 6.0 mils DFT per coat, 150 - 225 square feet per gallon per coat.
 - (3) Series 161 Tnemec-Fascure may be substituted for Series 66 if approved by the coating manufacturer.
 - b. Induron:
 - (1) Field Primer: Armorguard P-14 Epoxy Primer - 1 coat, 3.0 - 5.0 mils DFT per coat, 165 - 250 square feet per gallon per coat.
 - (2) Finish: Armorguard Epoxy - 2 coats, 3.0 - 6.0 mils DFT per coat, 165 - 250 square feet per gallon per coat.
 - c. or approved equal.
- D. Concrete Surfaces within containment areas:
- 1. Surface Preparation: SSPC SP7 brush-off blast cleaning.
 - 2. Product and Manufacturer: Provide one of the following:
 - a. Tnemec:
 - (1) Primer: Series 120-5002 Vinester, 15.0 to 18.0 dry mils.
 - (2) Filler and Surfacer: Series 120-5003 Vinester F&S, trowel or rubber float apply.
 - (3) Finish Coat: Series 120-5001 Grey Vinester, 15.0 to 18.0 dry mils.
 - b. or approved equal.

- E. PVC Pipe and Appurtenances
1. Surface Preparation:
 - a. Clean and dry.
 - b. Remove in markings by wiring down with a clean, lint-free cloth saturated with denatured alcohol.
 - c. Lightly sand or scarify exterior surfaces.
 2. Product Manufacturers: Provide one of the following:
 - a. Tnemec:
 - (1) Field Primer: Series 66 Hi-Build Epoxoline - 1 coat, 2.0 - 3.0 mils DFT per coat, 299 - 449 square feet per gallon per coat.
 - (2) Finish: Series 66 Hi-Build Epoxoline - 1 coat, 2.0 - 3.0 mils DFT per coat, 299 - 449 square feet per gallon per coat.
 - (3) Series
 - b. Induron:
 - (1) Field Primer: Armorguard Epoxy - 1 coat, 3.0 - 6.0 mils DFT per coat, 165 - 250 square feet per gallon per coat.
 - (2) Finish: Armorguard Epoxy - 1 coat, 3.0 - 6.0 mils DFT per coat, 165 - 250 square feet per gallon per coat.
 - c. or approved equal.
- F. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:
1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a block filler.
 - a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils.
 - (1) Glidden: 5317 Ultra-Hide Block Filler, Latex Interior-Exterior.
 - (2) Moore: Moorcraft Interior & Exterior Block Filler #173.
 - (3) PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.
 - (4) P & L: Z 98 Pro-Hide Plus Latex Block Filler.
 - (5) or approved equal.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
 - (1) Glidden: 4100 Series Spred Ultra Eggshell Latex Wall & Trim Paint.
 - (2) Moore: Moore's Regal AquaVelvet #319.
 - (3) PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.

- (4) P & L: Z/F 4000 Series Accolade Interior Velvet.
- (5) or approved equal.

- G. Other Chemical Feed or Potable Water Piping:
 - 1. Surface Preparation: In accordance with the label manufacturer's recommendation.
 - 2. Pipe Identification Markers and Arrows:
 - a. Provide adhesive pipe markers on all exposed process piping.
 - b. Markers shall indicate the fluid that the pipe is conveying.
 - c. Markers shall also have arrows indicating the direction of flow.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.2 SURFACE PREPARATION

- A. General:
 - 1. Perform all preparation and cleaning procedures as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.
 - 2. Remove all hardware, hardware accessories, machined surfaces, and similar items in place and not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.
 - 3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Schedule the cleaning process and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
 - 4. All surfaces which were not shop painted or which were improperly shop painted, and all abraded or rusted shop painted surfaces, which are to be painted, shall be prepared as specified below.
- B. Ferrous Metals (including Steel):
 - 1. Clean non-submerged ferrous surfaces including structural steel and miscellaneous metal to be shop primed, of all oil, grease, dirt, mill scale and other foreign matter by blast cleaning complying with SSPC-SP 6.

2. Clean submerged ferrous surfaces including structural steel and miscellaneous metal to be shop primed, of all oil, grease, dirt, mill scale and other foreign matter by blasting complying with SSPC-SP 10.
3. Clean non-submerged, ferrous surfaces that have not been shop coated of all oil, grease, dirt, loose mill scale and other foreign substances by commercial blasting, complying with SSPC-SP 6.
4. Clean submerged ferrous surfaces that have not been shop-coated or that have been improperly shop coated, of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP 10.
5. Treat bare and blased or pickled clean metal with metal treatment wash coat, prior to priming only if recommended by the paint manufacturer.
6. Touch-up shop-applied prime coats which have damaged or bare areas, with primer recommended by the coating manufacturer after commercial blasting complying with SSPC-SP 6.
7. For shop applied primers, surface preparation shall be as recommended by the coating manufacturer to make surface ready to receive the specified finish coats.

C. Cementitious Materials:

1. Prepare concrete masonry block, surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation. Existing concrete masonry wall within containment area, existing paint to be removed completely to bare masonry block.
2. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
3. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

3.3 MATERIALS PREPARATION

A. General:

1. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
2. Do not mix coating materials produced by different manufacturers, unless otherwise permitted by the manufacturer's instructions.
3. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
4. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not

stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

3.4 APPLICATION

A. General:

1. Apply paint by brush. Other mechanical application techniques such as roller, air spray, or airless spray in accordance with the manufacturer's directions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable shall be used only as approved by the Engineer. Use brushes best suited for the type of material being applied. Where approved by the Engineer use rollers of carpet, velvet back, or high pile sheeps wool as recommended by the paint manufacturer for material and texture required.
2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried.
3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense primary accent colors. Insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
4. Paint aluminum parts in contact with dissimilar materials as specified with appropriate primer.
5. Omit field primer on metal surfaces which have been shop primed touch-up paint shop prime coats only when approved by the Engineer.

B. Electrical Work:

1. Electrical items to be painted include, but are not limited to, the following:
 - a. Conduit and fittings.
 - b. Panels, junction boxes, and accessories.

C. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, and provide total dry film thickness (DFT) as specified. Apply extra coat if required to obtain specified total DFT.

D. Scheduling Painting:

1. Apply the first coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint not cause lifting or loss of adhesion of undercoat.

- E. Brush Application:
 - 1. Brush-out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. Neatly draw all glass and color break lines.
 - 2. Brush apply all primer or first coats, unless otherwise permitted to use mechanical applicators.
- F. Mechanical Applicators:
 - 1. Use mechanical methods for paint application when permitted by governing ordinances, paint manufacturer, and approved by Engineer. If permitted, limit to only those surfaces impracticable for brush applications.
 - 2. Confine spray application to metal framework, siding, decking, wire mesh and similar surfaces where hand brush work would be inferior and to other surfaces specifically recommended by paint manufacturer.
 - 3. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of 2 coats in one pass.
- G. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish, or repaint Work not in compliance with specified requirements as required by the Engineer.

3.5 PROTECTION

- A. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove all temporary protective wrappings provided for protection of the Work after completion of painting operations.

3.6 CLEAN-UP

- A. During the progress of the Work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
- B. Upon completion of painting Work, clean all paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of work of other trades, touch up and restore all damaged or defaced painted surfaces.

* * END OF SECTION * *

SECTION 113650

CHEMICAL FEED PUMP SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall furnish all labor, materials, equipment and incidentals required to provide chemical feed pump systems complete and operational as shown and specified.
2. Contractor shall furnish and install the new filter-aid storage and feed system before the removal of the current filter-aid systems.
3. Contractor shall install electrical conduit and wiring as well as equipment, materials, and appurtenances.
4. Contractor shall install all new signal wiring and conduit for new filter-aid system equipment and appurtenances back to control panels located in the Chemical Building electrical room, including making final terminations in the control panels. Contractor shall be responsible for labelling and tagging all new conductors. Contractor shall be responsible for completing all connections for furnished and installed equipment, including calibrations and communications from the new, permanent filter-aid system equipment to the Chemical Building control panels. Contractor shall size conduit for 150% of the number of conductors required for operations. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
 - a. Owner will be responsible for updating and/or modifying the Main Plant SCADA for the new filter-aid storage and feed system, including programming in the Main Plant SCADA.
 - b. The PAC work cannot occur until the existing filter-aid systems have been removed from their current location, and this cannot be done until the new filter-aid systems are installed, operational, and accepted by Owner and Engineer.
5. Refer to Plans for additional information and clarifications.

B. Related Work Specified Elsewhere:

1. Section 099000, Paintings and Coatings
2. Section 150670, PVC Piping and Tubing
3. Section 151000, Valves, Specials, and Appurtenances
4. Division 26, Electrical
5. Plans.

1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. Standards of the Hydraulic Institute.
 2. National Electric Code.
 3. Standards of National Electrical Manufacturers Association.
 4. Institute of Electrical and Electronic Engineers.
 5. American National Standards Institute.
 6. Standards of American Water Works Association.

1.3 SUBMITTALS

- A. Shop Drawings-Metering Pumps: Submit the following in accordance with Section 013000 for review and approval by the Owner and Engineer:
1. Submit certified shop drawings, manufacturer's specifications, catalog data, descriptive literature, illustrations, and other materials necessary for proper appraisal of quality and function.
 2. Include factory work sheets which identify each piece of equipment as specified and indicated on the drawings.
 3. Sales bulletins or other general publications are not acceptable as submittals for review except where necessary to provide supplemental technical data.
 4. Number and identify equipment to correspond with tag numbers on drawings. Use these numbers on all submittal sheets and shop drawings.
 5. Furnish for each system piping schematic and wiring schematic with interconnection diagram and a complete description of operation.
 6. Vendor to confirm with calculations that the pumps offered can handle the suction and discharge piping as shown, i.e., NPSH and peak back pressure.
 7. Operating and maintenance instructions and parts lists. See Paragraph B below for additional information regarding O&M data.
 8. Templates or certified setting plans, with tolerances, for anchor bolts.
 9. Motor data.
 10. Recommend spare parts other than those specified.
 11. Recommendations for short and long term storage.
- B. Submittals-Batch Mix Tank:
1. Manufacturers literature, specifications, engineering data, and mounting details including dimensions, size, and materials for the following:
 - a. Cross section of tank wall.
 - b. Submit copies of all manufacturers' quality control tests for record.
 - c. Submit design calculations on tank wall construction.
 - d. Layout an all critical dimensions, details, and accessories.
 - e. Gross and net weights.
 2. Operation and Maintenance Data:

- a. The Contractor shall furnish bound operation and maintenance manuals prepared by the tank manufacturer. The manual shall describe in detail the proper procedures for accessing and making connections to the tank. Proper safety procedures shall be outlined.
 3. Certification that the tank is suitable for its intended use.
 4. Provide manufacturer's guarantee for 1 year guarantee period.
 5. Mixer Support Stands: Stands shall be furnished by the mixer supplier. The mixer supplier shall determine the dimensions of each stand and submit sketch of tank, mixer, and stand assembly to verify appropriate mixer shaft length.
- C. Submittals-Batch Tank Mixer:
1. Manufacturer's literature, illustrations, specifications and engineering data including dimensions, materials, size, weight, bending moment and torque.
 2. Fabrication, assembly, installation and wiring diagrams.
 3. Provide setting drawings, templates and directions for the installation of anchor bolts and other anchorages.
 4. Calculations justifying velocity gradient (G) values, mixer horsepower, impeller design and equipment torque provisions, pumping and power numbers for impellers to be provided.
 5. Manufacturer shall certify the proper installation of mixer in relation to batch tank and support stand.
- D. Operation and Maintenance Data: Submit detailed operation and maintenance data for all chemical feed equipment provided under this Section and as approved by the Owner and Engineer. The Contractor shall provide four (4) hard copies of the O&M manual bound in 3-ring notebook. Additionally, the O&M manual shall be furnished electronically as a PDF file.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery: All necessary precautions shall be taken to prevent damage to chemical feed equipment and other materials during shipment and delivery. All materials shall be securely fastened to truck or rail car to prevent movement or damage during shipment.
- B. Shipping:
1. Ship equipment, material, and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
 2. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
 3. Deliver spare parts to site at same time as pertaining equipment. Deliver to the Owner after completion of work.

- C. Receiving:
 - 1. Inspect and inventory items upon delivery to site.
 - 2. Store and safeguard equipment, material, and spare parts in accordance with manufacturer's recommendations.
- D. Handling: All chemical feed equipment shall be handled very carefully. Equipment which is cracked, dented or otherwise damaged or dropped will not be acceptable.
- E. Storage: All chemical feed equipment shall be stored in approved enclosed shelter and off the ground, unless otherwise acceptable to Engineer.

1.5 WARRANTY

- A. The metering pump drives and pump heads shall have a manufacturer's warranty of at least five (5) years (from date of shipment).
- B. Manufacturer's standard warranty for batch mix tank, batch tank mixer, and other feed pump system appurtenances.

PART 2 - PRODUCTS

2.1 MATERIALS (FEED PUMPS)

- A. General:
 - 1. All chemical feed equipment shall have manufacturer's name, model number, working pressure if pertinent and other technical information as required cast in raised letters on body of equipment.
 - 2. All bolts, nuts, studs, etc. on or required to connect chemical feed equipment to bases, supports, walls, etc. shall be of stainless steel type 316.
 - 3. Bolts and nuts shall have hexagon heads and nuts.
 - 4. Gasket materials and installation shall conform to manufacturer's recommendations.
 - 5. Contractor shall install all new signal wiring and conduit for new filter-aid storage and feed system equipment and appurtenances back to control panels located in the Chemical Building electrical room, including making final terminations in the control panels. Contractor shall be responsible for labelling and tagging all new conductors. Contractor shall be responsible for completing all connections for furnished and installed equipment, including calibrations and any programming to the Chemical Building control panels. Contractor shall size conduit for 150% of the number of

conductors required for operations. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.

- a. Owner for updating and/or modifying the main plant SCADA for the new filter-aid storage and feed systems, including programming in the main plant SCADA.

7. Refer to Plans for additional information and clarification.

B. Metering Pumps:

1. General:

- a. Provide peristaltic-type metering feed pumps with all necessary accessories as specified and required for proper installation.
- b. All feed pumps shall have manufacturer's name, model number, working pressure if pertinent and other technical information as required cast in raised letters on body of equipment.
- c. Pump shall be capable of continuous pressure of 30 psi, intermittent pressure of 45 psi.
- d. Each pump shall consist of a spring-loaded track/pump head cover with safety interlock switch, ratchet type tube retainer mechanism, gear driven roller rotor assembly with integral variable speed drive. The magnetic interlock switch shall render the drive inoperable when opened.
- e. The process fluid shall only be in contact with the inside of the pump tubing. The pump tubing shall be Marprene, with a 64 Shore A durometer hardness. The tubing shall be sized to handle the entire flow range requirements.
- f. The tubing shall be in contact with the inside diameter of the track (housing) through an angle of 180° and be held in place on the suction and discharge by a hand operated ratcheted clamp mechanism. Tube clamps requiring tools are not acceptable. Suction and discharge shall be on the opposite side of the pump head. The tubing shall be replaceable with no disassembly of the pump head and without the use of tools.
- g. The rotor assembly shall be equipped with four Nylatron self-lubricating geared compression rollers driven by a 4:1 reduction planetary gear reducer. Compression rollers shall be supported by roller bearings on a shaft mounted to the end plates of the rotor assembly. Compression rollers shall be located 180° apart for compression of the hose against the track two times per rotor revolution. One roller shall at all times be fully engaged with the tubing providing compression to prevent backflow or siphoning. The pumping action is created by the occlusion (compression) of the pump hose and its subsequent restitution (return to original shape) causing a vacuum effect to draw the fluid into the suction side of the hose. Hose shall be adjustable by the adjustment of two knurled

nuts with springs which set the force with which the cover will bear down upon the tubing. The knurled nuts shall be fitted with set screws to limit compression. Occlusion shall come factory set to accommodate 4.0 mm wall thickness tube.

- h. Each rotor assembly shall be close-coupled to the output shaft of the drive gear motor by a 19 mm keyed shaft be axially secured to the shaft by a through-center retaining screw.
- i. The pump head shall be secured to the drive via two slotted screws and be self-locating.
- j. Flow through the hose shall be in the direction of the rotor rotation, which can be reversed.
- k. Each pump shall be capable of self-priming when completely dry with a suction lift capability of up to 30 feet of water. The pump shall be capable of running dry without damaging effects to the pump or hose.
- l. The pump shall use no check valves or diaphragms and not utilize any dynamic seals in contact with the pump.
- m. The track (housing) shall be of cast aluminum construction.
- n. The track shall be coated with Trimite polyester powder coat, electrostatically applied and baked.
- o. No special tools shall be required for regular maintenance.
- p. Each rotor assembly shall be mounted on roller bearings to a drive shaft supported between roller bearings mounted in the housing.
- q. A leak detector shall be furnished and installed with each pump head assembly. The leak detector shall be compatible with the approved feed pumps. The leak detector shall alert plant staff when there is a suspected leak. A leak detector kit shall also be furnished for the approved feed pumps.

2. Feed Pumps:

- a. Pump shall be of the positive displacement peristaltic type utilizing a flexible tube and spring-loaded roller or track.
- b. Conditions of Service:
 - 1) Purpose: Filter-aid
 - 2) Product: Aluminum Chlorohydrate
 - 3) Density: 1.34 g/mL (11.2 lb/gal)
 - 4) Concentration: 50% dilution (water/neat product)
 - 5) Rated Duty Cycle: Continuous
 - 6) Power Supply: 120 volt AC / 60 Hz
 - 7) Flow Rate: Varies
 - a) **Min: 95 mL/min**
 - b) **Max: 390 mL/min**
 - 8) Static Head: 15 ft
 - 9) Suction Head: Varies, flooded to 2.5 ft

- 10) TDH: 25 ft (approx.)
 - c. Quantity: 3 (2 installed, 1 spare/not installed)
 - 3. Drives:
 - a. Drive shall be rated for continuous 24 hour operation at ambient temperature to 40°C (104°F).
 - b. Pump drive shall be close coupled and self-aligning, requiring no flexible couplings.
 - c. Drive speed shall not exceed 350 rpm and be infinitely variable to a speed of 35 rpm.
 - d. Drive shall be capable of accepting an input signal ranging from 4-20 mA. Signal response may be scaled over any part of the drive speed range.
 - e. On/off contacts shall be functional in either manual or signal mode.
 - f. Manual or signal mode selectable via a two position selector switch located on the front of the panel.
 - g. Drive motor shall be permanent magnet DC with integral gearbox.
 - h. Drive enclosure shall be IP55 rated.
 - 4. Hose: Provide a minimum of 100 ft of Marprene tubing of the size recommended by the manufacturer.
 - 5. Refer to Section 3.2 herein for each pump systems requirements as well as the responsibilities of the Contractor.
 - 6. Acceptable Manufacturer:
 - a. Feed Pumps
 - 1) **Watson Marlow, Qdos30**
 - 2) or approved equal.

2.2 VALVES AND APPURTENANCES

- A. For the items described below, also refer to the Plans for additional information and details.
- B. PVC Piping and Clear Polyester Reinforced PVC Tubing: Refer to Specification Section 150670.
- C. Non-Metallic Ball Valves: Refer to Specification Section 151000.
- D. Pressure Gauges: Refer to Section 2.7/B below.

2.3 SPARE PARTS

- A. The Contractor shall furnish the recommended spare parts as recommended by the manufacturer, which shall include, but is not limited to, the following:
 - 1. Five (5) spare tube elements.

2. One (1) spare pump head assembly.

2.4 BATCH MIX TANK

- A. Polyethylene Day Tank (Cross-Linked):
 1. General: Tank shall be conical bottom-type tank with half-covered open top. A compatible steel support stand with integral mixer support/mount shall be also furnished and installed.
 2. Tank shall be molded from high density cross-linked polyethylene.
 3. Tank shall have visible markings for personnel to observe liquid level/volume (in gallons) inside the tank.
 4. The plastic shall not contain any filters. Ultraviolet stabilizer shall be a minimum of 0.25 percent and shall not exceed 0.50 percent.
 5. Pigments shall not exceed 1 percent of tank.
 6. Cylindrical tanks to be rotationally molded in one seamless piece.
 7. Furnish and install day tank as follows:

Chemical:	Aluminum Chlorohydrate, solution
Concentration (percent):	Dilute to 50%
	(1:1 product to water)
Quantity:	1
Volume:	100 gal
Diameter:	30 in.
Height:	36 in.
Bottom:	Conical (min 30 deg)
Bottom outlet:	1 in.
Cover:	Half
 8. Locations of the tank accessories shall be as shown on the drawings.
 9. Tank Stand: Furnish and install a heavy-duty steel stand with corrosion-resistant coating compatible with the approved day tank. Tank stand shall be Chem-Tainer, CK Series or approved equal.
 10. Tank Manufacturer:
 - a. Nalgene Company
 - b. Protectoplas Company
 - c. Snyder Industries
 - d. Chem-Tainer Industries
 - c. or approved equal

2.5 BATCH TANK MIXER

- A. General: The mixer shall be top-entering with an adjustable C-clamp for mounting the mixer on independent supports.
 1. Quantity: 1
- B. Mixer Assemblies:

1. All mixer assemblies shall be top entering with wetted parts to be 316 stainless steel.
 2. The size and length of shafts, impeller diameters, speeds, locations, and numbers of impellers for the chemical and size of batch tank specified, shall be established by the mixer manufacturer and submitted to the Engineer for approval.
 3. The shaft length shall have an adequate allowance for mixer mounting distance above the batch tank.
 4. The manufacturer shall verify that the specified wetted parts are suitable for the proposed chemical.
- C. Gear Drive:
1. Gear-driven mixers shall be designed and manufactured for continuous service at rated horsepower using a single reduction internal helical gear per AGMA Standards.
 2. Gears shall be greased, lubricated, and positively sealed against leakage and contamination.
- D. Mixer Motors:
1. All motors shall be maximum 3/4 Hp and shall have a service factor of 1.15.
 2. Motor electrical requirements shall be 480-volt, 3 phase, 60 hertz.
 3. Motor shall be totally enclosed, air cooled, with Class F insulation.
 4. The total temperature rise shall not exceed the temperature standard for Class F insulation when operating at a maximum ambient temperature of 40°C.
 5. The motor shall be grounded in accordance with NEC.
- E. Motor Starters: Motor starters and disconnects for each mixer, and power wiring shall be provided under Division 26.
- F. Acceptable Manufacturers: Subject to compliance with the contract documents, the following manufacturers are acceptable:
1. Lightnin, A Unit of General Signal
 2. Philadelphia Mixers Corporation
 3. or approved equal.

2.6 APPURTENANCES

- A. Calibration Cylinder:
1. Provide calibration cylinder as shown on the drawings.
 2. Calibration cylinders shall be clear PVC.
 3. Volume shall be 250 mL
 4. Calibration cylinder shall have appropriate graduations.

- B. Pressure Gauges: Furnish and install a pressure gauge on the discharge side of each metering pump system as indicated on the Plans and specified herein.
 - 1. Pressure gauges shall be bronze bourdon tube Marsh, McDaniel or Ashcroft with Type 316 stainless steel rack and pinion movement, or equal.
 - 2. The gauges shall be glycerin filled. Discharge gauges shall be 0 to 60 psig rated. Gauges shall 4-1/2 inch diameter furnished with 1/2 inch inlet.
 - 3. Quantity: 2

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in complete accordance with manufacturer's instructions and recommendations and the design documents. Valved flush connections shall be installed where indicated on Plans with the end connections compatible with house water hosing.
- B. Both filter-aid feed pumps shall be installed on the new equipment support pad (refer to Structural Plans).
 - 1. Piping and appurtenances may also be supported from or mounted to the support pad structure provided staff can easily access, operate and maintain equipment.
- C. Contractor shall connect to and utilize existing filter-aid piping. The connection of new piping to old is likely to occur in the existing cable tray mounted in the hallway corridor of the Chemical Building. Confirm location prior to the start of work. Also refer to Plans for additional information and details.
- D. Batch Mix Tank:
 - 1. Coordinate installation in accordance with the manufacturer's recommendation. Coordinate with piping and concrete work.
 - 2. Testing:
 - a. Upon completion of installation of tank and prior to connecting piping, Contractor shall provide blind flanges or other suitable plugs for all openings in tank, fill tank with clean water from a source approved by the Owner and conduct a leakage test as specified herein.
 - 1) Tank shall be filled up to the tangent line of the tank and left to sit over a 2 hour test period.
 - 2) There shall be no leakage over the test period. Leakage around openings in the tank shall be stopped by tightening nuts and bolts or replacing gaskets as required.
 - 3) Upon satisfactory completion of leakage test, Contractor shall drain tank and dispose of water in a suitable manner.

- E. Batch Tank Mixer:
 - 1. Install batch tank mixer in accordance with the manufacturers recommendations. Coordinate with electrical divisions as required.
 - 2. Test mixer and adjust shaft length and impeller(s) as necessary to obtain proper mixing of the chemical product.
- F. Power:
 - 1. Demolition: When the new filter-aid feed systems are operational and accepted by Owner, Owner will advise Contractor that demolition and removal of existing filter-aid system electrical systems can begin. Remove conduit and wiring as well as other electrical components from the current filter-aid area to the Chemical Building Electrical Room.
 - 2. New: For new electrical required in the new filter-aid storage and feed area, Contractor shall install electrical conduit and wiring as well as equipment, materials, and appurtenances.
- G. Signal Wiring and Conduit
 - 1. When the new filter-aid systems are operational and accepted by Owner, Contractor shall remove all existing filter-aid system signal wiring and conduit back to the control panels in the Chemical Building Electrical Room.
 - 2. Contractor shall install all new signal wiring and conduit for new filter-aid system equipment and appurtenances back to control panels located in the Chemical Building electrical room, including making final terminations in the control panels. Contractor shall be responsible for labelling and tagging all new conductors. Contractor shall be responsible for completing all connections for furnished and installed equipment, including calibrations and communications with the Chemical Building control panels. Contractor shall size conduit for 150% of the number of conductors required for operations.
 - a. Owner will be responsible for updating and/or modifying the Main Plant SCADA for the new filter-aid storage and feed system, including programming in the Main Plant SCADA.

3.2 PUMP OPERATIONS

- A. New pumps shall be capable of local or remote control and manual or automatic operation. Refer to Plans for additional information and clarification.
- B. Feed pumps shall be set in remote-automatic mode, the plant staff shall be able to set the desired dose for the active pump, and the feed pump will be paced by the existing raw water influent flow meter.

3.3 START-UP AND TRAINING SERVICES

- A. The Contractor shall be responsible for coordinating and scheduling factory authorized representative to:
 - 1. Inspect the installation of the pumps.
 - 2. Provide field calibration services
 - 3. Provide startup service and assistance,
 - 4. Provide training to the Owner's personnel.

- B. The manufacturer's representative shall provide a field report indicating the installations were acceptable and the equipment is in successful operation.
 - 1. Any deficiencies noted by the representative shall be corrected and re-inspected for acceptance. Additional equipment, materials, and services required to correct deficiencies shall be done at no additional cost to the Owner.
 - 2. Manufacturer shall verify all instruments have been properly field calibrated.

- C. The Contractor shall submit a proposed training agenda along with materials for review and approval by the Owner and Engineer. The proposed training shall be approved by the Owner and Engineer prior to scheduling the training. Additionally, the O&M manuals shall be furnished prior to the training.

* * END OF SECTION * *

SECTION 132000

POWDERED ACTIVATED CARBON DRY FEEDER SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install complete, ready for operation, and field test the powdered activated carbon (PAC) dry feeder system as shown on the Plans and as specified herein.
1. The existing PAC storage and feed system shall be properly removed and disposed of off-site as shown on the Plans.
 - a. The removal of the existing PAC systems cannot be done until the new PAC systems are installed, operational, and accepted by Owner and Engineer; and
 - b. The PAC work cannot occur until the existing filter-aid systems have been removed from their current location, and this cannot be done until the new filter-aid systems are installed, operational, and accepted by Owner and Engineer.
 2. Coordinate the demolition of existing PAC equipment and materials with the installation of new equipment and associated work along with water treatment plant operations. Refer to the Plans and applicable specification sections for additional information and details.
 3. Contractor shall install new electrical conduit and wiring for new equipment, components, and appurtenances. Electrical conduit and wiring as well as equipment, materials, and appurtenances shall be appropriate for a Class II, Division I, Group F environment.
 5. Contractor shall install all new signal wiring and conduit for new PAC system equipment and appurtenances as well the PAC control panel back to the existing control panels located in the Chemical Building electrical room, including making final termination in the existing control panels. Inside the PAC storage and feed room, conduit and wiring as well as equipment, materials, and appurtenances shall be appropriate for a Class II, Division I, Group F rated area. Contractor shall be responsible for labelling and tagging all new conductors. Contractor shall be responsible for completing all connections for furnished and installed equipment, including the PAC system control panel as well as the calibrations and the programming from the PAC system control panel to the Chemical Building control panels. Contractor shall size conduit for 150% of the number of conductors required for operations. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
 - a. Owner will be responsible for updating and/or modifying the Main Plant SCADA for the new PAC storage and feed system, including programming in the Main Plant SCADA.

B. General Design

1. All of the equipment specified herein shall be furnished by a single manufacturer and shall be in complete conformity with these Specifications. All of the equipment specified herein is intended to be standard equipment for use in a PAC dry feeder system and shall include the following:
 - a. Volumetric screw feeder with VFD and explosion-proof motor.
 - b. Feeder supply hopper.
 - c. Wetting cone for PAC wetting.
 - d. Eductor to create PAC solution and supply to feed point.
 - e. Steel support frame.
 - f. Bag loading system including:
 - 1) 1-Ton hoist with trolley motors.
 - 2) Bulk bag lifting adapter.
 - 3) Safety shield.
 - g. System control panel.
 - h. Miscellaneous associated equipment required for the proper operation of the system, including but not limited to valves, piping, couplings, fittings, gauges etc.
2. System Operations
 - a. Dry PAC will be delivered in a 900-lb bag. The 900-lb bag shall be manually attached to the chain hoist by the four straps on the bulk bag using the bulk bag lifting adapter. The bag will be lifted and positioned over the volumetric feeder hopper and lowered to rest on the safety shield using the hand held hoist control pendant and the electric trolley.
 - b. Once the bag is in place, the bottom flaps will be manually untied, releasing the built-in discharge chute. The inner liner of the discharge chute is placed inside the bag chute adapter and the outside shell of the discharge chute is placed around the outside of the hopper connector. The bag is raised slightly to tighten the chute, then the retainer strap around the discharge chutes can be released to allow PAC to flow into the feeder hopper.
 - c. The feeder hopper will provide PAC to the volumetric screw feeder which will discharge into the wetting cone by means of the drop tube and mix with plant make-up water to wet the carbon.
 - d. The PAC solution in the wetting cone will flow into the eductor by the vacuum created by the make-up water supply to the eductor.
 - e. The PAC solution from the eductor will flow to the location shown on the Plans.
3. The PAC feeder system will be located in the new PAC Feed Room (Room 106) inside the existing Chemical Building shown on the Plans. New feed piping and hosing shall be installed from the PAC Feed Room, through the Chemical Building (in overhead piping containment tray) and Walkway Tunnel, to the existing 30-in. Raw Water line in the basement of the Main Building (injection point). Contractor shall install a new corporation stop for the PAC feed into the 30-in Raw Water line in the vicinity of the existing chemical injection feed points. See Plans for additional information and clarification.

4. Contractor/Manufacturer shall be aware of height limitations for the new PAC feed area with regard to the equipment, materials, and appurtenances proposed. Contractor shall be responsible for coordinating the installation with other trades and disciplines.
 - a. Floor-to-Ceiling Height (approx.): 19.5 ft.
 - b. Contractor shall field verify dimensions of space, particularly the available height, prior to procurement and prior to installation of approved equipment.
5. A carbon feed system requiring a proprietary powdered activated carbon (PAC) product will not be accepted by the Owner.

1.2 QUALITY ASSURANCE

- A. The PAC feeder system shall be the product of the same or similar size and capacity from a manufacturer that has been regularly engaged in the design, manufacturing, and installation of PAC feeder systems for at least five years. To demonstrate this, Manufacturer shall furnish at least three (3) references for similar installations that have been in successful operation within the last five years.
- B. A single supplier shall provide and have complete responsibility for coordination, design, and proper function of all related equipment including electrical controls and volumetric feed equipment.
- C. The manufacturer shall be responsible for the detailed design, the preparation of the required submittal data including operation and maintenance manuals, and the system installation, startup, and warranty of the complete PAC feed furnished and installed.
- D. The PAC feeder system shall provide all equipment, materials, and equipment to furnish and install the PAC feeder system as shown on the Plans and specified herein. For the items the Manufacturer does not complete, the Contractor shall be responsible for the work to complete the installations and connections to make the PAC feeder system operate as required.

1.3 SUBMITTALS

- A. Materials and Shop Drawings: Submit to the Engineer for approval, as provided in Section 013000, copies of all materials required to establish compliance with these Specifications. Submittals shall include at least the following:
 1. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
 2. General arrangement and plan drawings of the system.
 3. Descriptive literature, bulletins, and/or catalogs of each item of equipment.
 4. The empty weight and maximum operating weight of each major item of equipment.
 5. A complete total bill of materials for all equipment.
 6. A list of the manufacturer's recommended spare parts. Include gaskets, packing, and other parts on the list.
 7. System piping and wiring diagram.

8. Complete wiring diagrams and schematics of each control panel, controller, control device, and operator's station furnished under this Section.
 9. Control panel layout drawings.
 10. Complete wiring diagrams and schematics of all power and control systems showing wiring requirements between all system components, motors, sensors, control panels, and related systems including connections to work of other Sections.
 11. PLC ladder logic.
 12. Written description of system operation and maintenance.
 13. Clearly indicate any nonconforming items or exceptions to the Contract Documents, and provide proposed alternatives for consideration.
 - a. Owner and Engineer will review and determine whether or not any non-conforming items and proposed exceptions are acceptable.
 14. Prepare the above information as a single packaged shop drawing submittal.
- B. Operating Instructions
1. Operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment.
 2. A factory representative of the PAC feed system equipment manufacturer who has complete knowledge of proper operation and maintenance shall be provided for a minimum of one (1) eight-hour working day, travel time excluded, to instruct representatives of the Owner and the Engineer on proper operation and maintenance. With the Owner's permission, this work may be conducted in conjunction with the inspection of the installation and test run as provided under PART 3 - EXECUTION. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, or the Contractor's installation, additional service shall be provided at no cost to the Owner

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. As much as practicable, equipment shall be factory assembled. The equipment parts and assemblies that are, of necessity, shipped unassembled shall be furnished with an assembly plan and instructions. The separate parts and assemblies shall be match-marked or tagged in a manner to facilitate field assembly of the equipment.
- B. Generally, machined and unpainted parts subject to damage by the elements shall be protected with an application of a strippable protective coating.
- C. Equipment shall be packaged or crated in a manner that will protect equipment from damage during shipping handling, and storage.
- D. The outside of the package or crate shall be adequately marked or tagged to indicate its contents by equipment name, Contract number, and equipment number if applicable; approximate weight; state any special precautions for handling; and indicate the recommended requirements for storage prior to installation.

- E. Spare parts and special tools shall be properly marked to identify the associated equipment by name, equipment, and part number. Parts shall be packaged in a manner for protection against damage from the elements during shipping, handling, and storage. Spare parts and special tools shall be shipped in appropriately sized, hinged-cover, wood or metal boxes. The boxes shall be marked to indicate the contents and use. Delivery of special tools shall be made prior to the time the associated equipment is scheduled for the initial test run.
- F. Unloading equipment at the jobsite shall be by Installing Contractor, and shall be responsible for ensuring equipment and materials to assist with the unloading are available at the time of delivery. Contractor shall indicate the estimated delivery on the Construction Schedule and subsequent updates. Contractor shall provide Owner and Engineer with at least a 48-hour notice prior to the expected delivery time to the site. Contractor shall coordinate with Owner, Engineer, and plant staff for the delivery, which shall be during regular daytime working hours at the treatment facility, and ensure the delivery does not interfere or impact other deliveries either for the Contractor or, more importantly, plant operations.

1.5 WARRANTY AND GUARANTEES

- A. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during warranty period, it shall be replaced at no expense to the Owner.
- B. Manufacturer shall warrant the equipment (complete new equipment) to be free from defects in material and workmanship for a period of one (1) year [five (5) years for the entire weighing mechanism of the feeder] from the date of Substantial Completion.

1.6 SPARE PARTS

- A. Special tools required for normal operation and maintenance shall be supplied for each piece of equipment furnished.
- B. Each piece of equipment shall be furnished with the manufacturer's recommended spare parts for the first year of operation.
- C. The following spare parts are shall be provided at a minimum:
 - 1. One (1) eductor.
 - 2. One (1) point level probe.
 - 3. One (1) 3-way switching solenoid valve.
 - 4. One (1) feeder drive motor.
 - 5. One (1) volumetric feeder auger & gasket.
- D. All tools and spare parts shall be furnished in containers clearly identified with indelible markings as to their contents. Each container shall be packed with its contents protected for storage. All tools shall be furnished in steel tool boxes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the requirements of these Specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to, the following:
 - 1. Acrison.
 - 2. or approved equal.

2.2 GENERAL

- A. These Specifications are intended to give a general description of what is required, but do not cover details of construction which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to include the furnishing, shop testing, delivery, installation, supervision, and field testing of all materials, equipment and appurtenances for the PAC dry feeder system equipment as herein specified, whether specifically mentioned in these Specifications or not. Also included in these Specifications is the instruction of the regular operating personnel in the care, operation and maintenance of all equipment.
- B. All necessary accessory equipment and auxiliaries required for the proper functioning of the PAC dry feeder system installation incorporating the highest degree of standards for the specified type of service shall be furnished by the PAC dry feeder system supplier whether or not specifically mentioned in these Specifications or shown on the Plans.
- C. Construction shall meet NSF codes and requirements

2.3 MATERIALS AND EQUIPMENT

- A. Volumetric Feeder
 - 1. The volumetric auger-type feeder shall be designed with an AC induction motor, gearbox and hopper assembly on a tubular steel support frame.
 - 2. The hopper shall have a minimum capacity of 3 cubic feet and shall be constructed of Type 304 stainless steel.
 - 3. The metering mechanism shall consist of a large "conditioning auger" or "intromitter", concentrically mounted around a smaller "metering auger", independently driven at dissimilar speeds in a fixed proportion to each other by a single variable speed single gearmotor drive.
 - 4. The feeder shall be supplied with a low hopper level switch.
 - 5. A vibrator shall be provided to promote reliable PAC flow into the hopper.
 - 6. The drive mechanism shall be enclosed to comply with OSHA safety requirements for rotating machinery (OSHA Section 1910.212 and .219 Machine Guarding).
 - 7. The volumetric feeder shall be driven by a 1.0 HP AC induction motor with a VFD providing finite local adjustment of the PAC feeding rate. The VFD shall allow a 30:1 turndown ratio providing a wide range of dosing levels. The VFD shall be a PowerFlex 40 drive or equal. The feeder controller shall

be programmed to allow feeding of the carbon at a constant rate in pounds per hour or to follow a 4-20 mA analog signal, representing 0% to 100% of the maximum feed rate, provided from the PLC in the system control panel PLC.

8. The feeder shall have the following general specifications:
 - a. Feed Auger Size: 1 1/8"
 - b. Conditioning Auger Size 10"
 - c. Feed Rate Adjustment: Manual via local HMI or remote signal
 - d. Volumetric Capacity: 2 to 16 pounds per hour.
 - e. Materials of construction:
 - 1) Supply Hopper: Type 304 Stainless Steel
 - 2) Metering Auger Type 316 Stainless Steel
 - 3) Conditioning Auger Type 316 Stainless Steel
 - 4) Drop Tube Type 304 Stainless Steel
 - f. Feed Accuracy: 2% of full scale
9. The feeder shall be equipped with a removable drop tube, located between the volumetric feeder outlet and the inlet to the wetting cone to direct the PAC to the wetting cone.

B. PAC Wetting Cone

1. Materials: Type 304 stainless steel.
2. Connections: Provide a make-up water supply connection at the top of the wetting cone for wetting the carbon and a connection to the eductor at the bottom of the wetting cone.
3. Water shall be added tangentially to the wetting cone, which shall form a vortex to sweep the inner surfaces of the wetting cone, preventing bridging and subsequent blockages.
4. Mounting: Wetting cone shall be mounted directly below the screw feeder discharge through the drop tube.
5. Provide a high liquid level switch to indicate when high liquid level is sensed and provide an alarm.
6. A piped overflow shall be provided to keep water from backing up into the feeder.

C. Eductor

1. A 1-1/2" eductor shall be installed to mix and convey the PAC slurry. The eductor shall be suitable for mixing carbon slurry with make-up water where the make-up water serves as the motive and the slurry is drawn into the eductor from the partial vacuum created by the high velocity stream in the eductor.
2. Selection of the eductor shall be based on the following parameters:
 - a. Motive water flow of 65 gpm, maximum
 - b. Motive water pressure of 100 psig, maximum
 - c. Water flow into the wetting cone of 3 gpm (included in motive water flow)
 - d. Injection point backpressure of 25 psig
 - e. 2" PVC discharge pipe with length as shown on the Plans.
3. Materials: Type 316 stainless steel.

- D. Water Control: Control of flow through the eductor shall be provided by a motive liquid pressure switch, motive liquid supply ball control valve, slurry discharge ball control valve, and a drain ball control valve which shall be controlled by the PLC in the PAC system control panel.
- E. Bulk Bag Lifting and Positioning Equipment
1. Electric Chain Hoist with Trolley: An electric chain hoist with an electric trolley shall be provided to lift the bulk bags from the floor and to position and hold the bulk bags above the feeder hopper inlet connection.
 - a. The chain hoist shall be rated for one-ton capacity.
 - b. All bearings shall be heavy duty, permanently sealed with lifetime lubrication.
 - c. Hoist Motor: Single speed, 1/2 HP, 120 VAC, 1 phase, 60 Hz.
 - d. Trolley Motor: Single Speed, 1/4 hp, 120 VAC, 1phase, 60 Hertz.
 - e. Chain hoist shall be CM Lodestar or equal. Trolley shall be CM Series 635 Motor Driven Trolley or equal. Chain hoist and trolley shall be provided by the same manufacturer.
 - f. A single pendent push-button control station with push-buttons to control all operations of the hoist and the trolley shall be provided. The pendent control station shall be easily accessible from the operating floor.
 2. Bulk Bag Lifting Adapter: A bulk bag lifting adapter or "spider" frame shall be provided to evenly lift and position the bulk bags.
 - a. The lifting adapter shall be a tubular steel lifting cross for use with the chain hoist.
 - b. The adapter shall be used for a 900 pound (net) woven polypropylene bulk bag with aplastic liner.
 4. Safety Shield: A safety shield shall be provided on the frame to support the bulk bag and protect the operator when releasing the feed chute.
 5. Bulk Bag Connector: The outer bag chute shall be connected to the hopper inlet opening using an adjustable clamp to form a dust-tight connection.
- F. Support Frame
1. The feeder system shall be supplied with a support frame designed to support the full weight of feeder, hopper, full bulk bag, bag loading equipment, product in the feeder hopper, wetting cone, drop tube, eductor, control panel, and associated valves, instruments and piping.
 2. The frame shall be fabricated from 3" square (minimum) ASTM A-36 carbon steel tubing and structural steel members, and divided into no more than three (3) sections. The upper and lower tower sections shall be provided with mating flanges, which will allow the upper section to be set on top of the lower tower section and bolted in place. Four (4) base plates with at least 16 anchoring points shall be provided to anchor the system to the concrete foundation. The PAC feed equipment with associated piping and instruments shall be mounted in the lower tower section and the monorail and hoist equipment shall be mounted in the upper tower section.
 3. The frame shall include a monorail for the trolley and chain hoist.
 4. Anchor bolts shall be provided and installed by the Contractor. Anchors shall be designed by the PAC system manufacturer to resist overturning loads

associated with the lifting of a full bulk bag and applicable wind loads pursuant to the local building code. Anchor bolts shall be of Type 316 stainless steel.

5. All external carbon steel surfaces shall be blasted per SSPC SP6 commercial blast to obtain a 1.5 mil average profile, prime coated with Sherwin Williams Dura-Plate Multi-Purpose Epoxy Primer (4-8 mils DFT) and finish coated with Sherwin Williams Acrolon 218 HS Acrylic Polyurethane (3-6 mils DFT) in black, at the factory. Equivalent paint products manufactured by Koppers, Tnemec, or Glidden are also acceptable.

G. Instrumentation

1. Pressure Switch: Pressure switches shall be installed to monitor the motive water pressure and the wash water pressure and shall stop the feeder when insufficient water pressure is available. The pressure switches shall be interlocked to prevent the feeder from starting until sufficient water pressure has been established. Pressure switches shall be Ashcroft Series B or approved equal.
2. Pressure Gauges/Indicators: Pressure indicators shall be installed to monitor the supply/motive water pressure, the slurry discharge pressure and the wash water pressure. Pressure gauges shall be Ashcroft Duragauge or approved equal. The PAC system manufacturer shall supply all pressure gauges associated with the system.
3. Point Level Probe: A point level probe shall be installed to sense the PAC level in the feeder hopper and to provide an alarm signal when the level falls below the probe. The probe shall be a rotary paddle-type as furnished by the manufacturer.
4. Vortex Water Level Switch: A conductance-type level switch shall be furnished by the manufacturer to monitor the water level in the wetting cone. The switch shall be mounted in the wetting cone overflow and shall provide an alarm signal if the water level covers the probe.

H. Piping and Valves

1. Motive water and slurry piping within the system frame shall be Type 304 stainless steel, threaded or socket welded and suitable for a pressure of 150 psi.
2. Valves shall be stainless steel or bronze, threaded, minimum of ANSI 150 pound class, unless specified otherwise.
3. Motorized Ball Valves: Three (3) 3-piece 1½" electric actuated stainless steel ball valves shall be installed to control the flow of liquids within the system. Individual valves shall control the flow of motive water, control the discharge of the carbon slurry, and drain the system. The valves and 1/4 turn actuators shall be manufactured by NIBCO or approved equal.
4. Wash Water Regulator: A pressure regulating valve shall be provided to maintain a relatively constant flow of wash water into the wetting cone. The regulator shall be manufactured by Watts or approved equal.
5. Solenoid Valves: Two (2) brass body, electric solenoid valves shall be installed to control operation of the three (3) motorized ball valves. Solenoid valves shall be brass body, soft-seated, with 120V AC solenoid coils.

Solenoid operators shall be molded coil in NEMA 4 enclosures. Valves shall be ASCO Red Hat or approved equal.

6. The PAC solution line outside the packaged system and in the yard shall be Schedule 80 PVC as specified under Section 15067: PVC Pipe and Fittings, and sized as shown on the Plans. The solution and plant water lines in the PAC area shall be supported as specified in Sections 15060 and 15109: Piping Support Systems. Long radius elbows shall be used where 90 degree bends are required, and a clean-out tee shall be provided at each change of direction.

- I. All electrical equipment and instrumentation located inside or inserted into enclosed areas containing PAC including bulk bag, supply hopper, volumetric feeder, drop tube and wetting cone and the volumetric feeder motor shall be rated for a Class II, Division 1, Group F environment. PAC system control panel shall be wall-mounted outside of the new PAC feed room.

2.4 CONTROLS

- A. A PLC and HMI, with input from remote sensors, shall control the sequences of events throughout the system and provide alarms to annunciate problems and interlocks to protect the system. The system shall be configured to feed a constant pounds per hour of PAC or to vary the feed rate via an analog signal provided from a remote source. During normal operation, operator attention shall not be required, as the system shall operate automatically once the mode of operation and the feed rate have been selected.
- B. System Control Panel
 1. The PAC system controls shall be contained within a dedicated control panel, including disconnect switches, breakers, PLC, power supply, transformer, feeder VFD, control relays, Human Machine Interface (HMI), terminal blocks, switches, etc. The panel shall be compliant with all applicable NEC and NEMA requirements.
 2. Control wiring shall meet the following requirements:
 - a. The control wiring philosophy shall be such that all field control devices utilize normally closed contacts during normal operating conditions.
 - b. A contact opening or an open circuit shall result in an alarm condition for the specific device.
 - c. Loss of power to a control device shall result in an alarm condition.
 3. The control panel shall be provided with the following items and/or features:
 - a. Panel shall be constructed of Type 316 stainless steel and rated NEMA 4X.
 - b. Terminal blocks shall be installed for termination of external connections.
 - c. Terminal blocks for voltage of 120 volts and less shall be equal to Allen-Bradley 1492-W10.
 - d. All selector switches, pilot lights, push buttons and other devices that will be visible on the front of the control panels shall have Lamacoid nameplates, which shall be white with black letters.

- e. All wiring shall be installed in Panduit or similar wireways and separated into categories (i.e. 120 volt control, 24 volt DC, digital & analog signal, etc.) to the extent practical. All terminal strips for all wiring terminations shall be numbered.
 - f. Wiring shall be stranded copper, 600 volt, THHN insulated, extra flexible type. As a minimum wire size shall be #12 AWG for all power wiring, #14 AWG for all external control wiring, #16 AWG for all control panel internal control wiring and #18 AWG twisted shielded pair for analog signal conductors. Wiring shall be color coded as follows:
 - 1) Ground wiring shall be green.
 - 2) 120 volt AC, 480 volt AC and 90 volt DC power wiring shall be black.
 - 3) Neutral wiring shall be white.
 - 4) 120 volt AC control wiring shall be red.
 - 5) 24 volt DC control wiring shall be blue.
 - g. Wiring at all terminals within panels, junction boxes, and field devices shall be numbered with shrink fit, machine printed labels.
 - 4. The following control switches shall be located on the control panel:
 - a. Emergency stop pushbutton switch.
 - b. Main disconnect switch.
- C. Programmable Logic Controller: The PLC for control of the system shall be Allen-Bradley with Ethernet communications.
- D. Electrical Components
- 1. 120 Volt Circuit Breakers: Allen-Bradley 1492-CB or equal.
 - 2. Control Relays: Allen-Bradley Type HA or approved equal.
 - 3. Selectors and Push Buttons: 30.5 mm, heavy duty, NEMA 4X rated; contacts rated 10 amps continuous, 6 amps break at 120 VAC, equal to Allen-Bradley Type 800H.
 - 4. Indicating Lights: 30.5 mm, heavy duty, NEMA 4X rated, 6 volt transformer type, equal to Allen-Bradley Type 800H.
- E. Human Machine Interface: The HMI for control of the system shall be an Allen Bradley PanelView 400 Plus I, or approved equal.
- 1. The following status and alarms shall be shown on the HMI:
 - a. Feeder Malfunction.
 - b. Vortex Water Level High.
 - c. Motive Water Pressure Low.
 - d. Wash Water Pressure Low.
 - e. Feeder Hopper PAC Level Low.
 - 2. The following control functions shall be on the HMI:
 - a. System Operation Local/Remote Selector.
 - b. Local Start PAC System.
 - c. Local Stop PAC System.
 - d. Feeder Off/Auto Selector.
 - e. Alarm Acknowledge.
 - f. System Mode Non-Paced/Paced Selector.

- g. Fluidizing Cycle On/Off/Auto Selector.
 - h. Trip Reset Selector.
 - i. PAC Feed Rate Selection.
- 3. The SYSTEM OPERATION selector on the control panel HMI shall select whether the system is started and stopped via local selection on the HMI (LOCAL) or remotely by energizing a relay inside the PLC in the Main Filter Building Control Room (REMOTE).
 - 4. The SYSTEM MODE selector on the control panel HMI shall select whether the feeder runs at a constant rate (NON-PACED) or will follow a 4-20 mA DC signal (PACED).
 - 5. The FLUIDIZING CYCLE selector on the HMI shall select whether each pulse is manually initiated (ON) or automatically pulse on a timed basis when the feeder is in operation (AUTO).
- F. The control panel shall require a 120V, 1 phase, 60 Hz electrical power supply.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prior to prime coating, all metal surfaces of the equipment within the PAC dry feeder system shall be thoroughly clean, dry, and free from all millscale, rust, grease, dirt, paint, and other foreign substances to the satisfaction of the Owner and Engineer.
- B. All metal surfaces except factory finished equipment surfaces and those obviously not to be painted such as aluminum and stainless steel shall be shop primed as specified in Section 099000, Paintings and Coatings.
- C. Finish coating except on factory finished manufacturer's equipment shall be compatible with the prime coating used and shall be as specified in Section 099000, Paintings and Coatings.

3.2 INSTALLATION

- A. Each unit shall be installed in accordance with the manufacturer's instructions and accurately aligned in orientation with related equipment.
- B. The Contractor shall supply all necessary anchor bolts, temporary lifting equipment, power, labor and all other requirements for satisfactory installation.
- C. All electrical equipment and instrumentation located inside or inserted into enclosed areas containing PAC including bulk bag, supply hopper, volumetric feeder, drop tube and wetting cone and the volumetric feeder motor shall be rated for a Class II, Division 1, Group F environment. PAC system control panel shall be wall-mounted outside of the new PAC feed room.

3.3 INSPECTION AND TESTING

- A. PAC Dry Feed System
 - 1. Upon completion of installation, the Contractor, in the presence of the Owner and Engineer and a qualified manufacturer's representative, shall perform an initial field test on the PAC dry feed system to ensure the functioning of all component parts to the satisfaction of the Owner and Engineer. The Contractor shall furnish all labor, equipment, water and power required to perform each test. The Owner shall supply the necessary PAC bags for the test.
 - 2. Approval of the initial field test by the Owner and Engineer shall not constitute final acceptance of the equipment furnished.
- B. After the plant is in operation, a full load operating test shall be performed in the presence of the Owner and Engineer and a qualified manufacturer's representative. The Contractor shall furnish all labor, materials and equipment required for such test and shall correct any deficiencies noted, by repairing or replacing the defective component, and retesting as required until the equipment meets the satisfaction of the Owner. The services of a competent and experienced representative shall be furnished by the manufacturer for a minimum of one (1) complete 8-hour day to satisfy the full load operating test requirements. A 48-hour operating period of the PAC dry feed system will be required before final acceptance.

3.4 START-UP AND INSTRUCTION

- A. The equipment manufacturer shall furnish the services of a competent and experienced representative who has complete knowledge of proper operation and maintenance of the equipment for a period of not less than two (2) days to inspect the installed equipment, supervise the initial test run, and to provide instructions to the plant personnel. This instruction period shall be scheduled at least ten days in advance with the Owner and shall take place prior to plant start-up and acceptance by the Owner. The final copies of operation and maintenance manuals must have been delivered to the Owner and Engineer prior to scheduling the instruction period with the Owner.

****END OF SECTION****

SECTION 137000

ULTRAVIOLET TREATMENT SYSTEM

PART 1 – GENERAL

1.1 GENERAL

A. Overview:

1. The ultraviolet (UV) treatment system and work specified herein is to be considered a primary bid item as part of the Contractor's bid package submission.
 - a. As part of the bid package submission, the Contractor shall also provide a bid price for the add alternative bid item to furnish and install an UV LED treatment system complete as shown on the Plans and specified under Section 137100.
 - b. If the UV LED treatment system is accepted and approved by the Owner, then the medium-pressure ultraviolet treatment system (as shown and specified under Section 013700) will not be furnished and installed.
2. This section covers the general requirements for the design, fabrication, installation, and testing of one (1) new medium-pressure ultraviolet (UV) disinfection system.
3. As part of this work, the Contractor shall also remove the two (2) existing medium-pressure UV disinfection systems from service, including the associated control panels and the UPS.
4. Some related equipment and infrastructure shall remain in place and available to be utilized for the new UV disinfection system. Refer to Contract Documents for additional information and details.
5. The new UV system shall include the following principal components:
 1. One (1) medium-pressure UV reactors with quartz sleeves.
 2. UV intensity sensors.
 3. Reactor air relief vent valve.
 4. Semi-automatic/automatic cleaning system.
 5. Online UV transmittance monitor.
 6. System instrumentation and controls, including a new remote HMI panel.
 7. Accessories.
 8. Spare parts.
 9. Special tools required for a complete system, whether or not specified in this section.
6. The UV system shall be capable of disinfecting filter effluent to meet the water quality standards specified in this section.

7. The manufacturer shall supply all accessories and appurtenances required for satisfactory operation of the integrated UV disinfection system.
8. The UV System shall be furnished by a single qualified Ultraviolet System Supplier who shall provide all services, equipment, and appurtenances required for a complete, fully integrated and operational system that meets all the design conditions, testing requirements, performance guarantees, and warranties specified herein.

1.2 DEFINITIONS

- A. UV Dose – The total radiant energy incident from all directions onto an infinitesimally small sphere of area dA , divided by dA , for a given contact time in seconds. The unit of UV dose shall be millijoules per square centimeter (mJ/cm^2) and shall be calculated as follows:

$$D = I \cdot t$$

Where: D = UV Dose, $mW \cdot s/cm^2$ (mJ/cm^2)
 I = average intensity or irradiance, mW/cm^2
 t = average exposure time, s

- B. UV Transmittance (UVT) – The transmittance of ultraviolet light at a wavelength of 254 nm through the water across a pathlength of 1 cm. UV transmittance shall be calculated from UV absorbance (A) at 254 nm by the following equation:

$$\text{Percent transmittance} = 100 \times 10^{-A}$$

- C. Intensity or Irradiance – The total radiant power incident from all directions onto a infinitesimally small sphere of cross-sectional area dA , divided by dA . The units of intensity shall be milliwatts per square centimeter (mW/cm^2).
- D. Validated Reactor – A reactor that has been validated under the below conditions. The validation protocol shall be submitted to the Owner and Engineer for review and approval. The Owner shall have final approval of the validation procedure.
1. The validated flow range contains the design flow range per reactor as required.
 2. The validated UVT range contains the operational UV transmittance range as required.
 3. The validated dose range contains the operational germicidal UV dose range as required.
- E. Equivalent Dose – The maximum dose necessary for a full-scale UV system to achieve a level of inactivation of a specific organism equivalent to the level of inactivation for the same organism achieved in a laboratory using a collimated

beam apparatus with a low pressure lamp producing UV energy at a wavelength of 254 nm to test a water sample collected at the same time.

- F. Medium-Pressure (MP) Lamp – A lamp with the input power converted to UV light at 200 – 400 nm with a pressure of approximately 20 psi.
- G. Guaranteed Life – The manufacturer’s warranted life of the lamp, sleeve, ballast, and sensor as submitted by Ultraviolet System Supplier and acceptable to Owner and Engineer.
- H. Expected Lamp Life – The manufacturer’s estimated life of the lamp based on the operating conditions.
- I. Prorated Start Time – The time beginning after a minimum of 20 percent of the guaranteed life has lapsed.
- J. Guaranteed Maximum Total System Energy Use – A calculated present worth value based on Ultraviolet System Supplier data reflecting energy use in kilowatt-hours per year.
- K. Guaranteed Maximum Head Loss – The head loss in inches of water column allowed through the UV reactor between the inlet flange and the outlet flange at peak production rate.
- L. Definitions of Ultraviolet (UV) Reactor/Component Failure:
 - 1. UV Lamps shall be deemed to have failed when:
 - a. UV Lamp fails to light when powered.
 - b. UV Lamp fails to achieve performance requirements for disinfection specified herein.
 - c. UV Intensity falls below UV Supplier’s guaranteed end of life output (with UV Transmittance (UVT) > design value; sleeves cleaned by the UV Reactor’s automatic cleaning system).
 - 2. UV Sleeves shall be deemed to have failed when:
 - a. UV Sleeve breaks or leaks water while operating within the conditions specified herein.
 - b. UV Sleeve output falls below UV Supplier’s guaranteed end of life output immediately after sleeve cleaning by the UV Reactor’s automatic cleaning system.
 - 3. UV Ballasts shall be deemed to have failed when: UV Ballasts fail to properly operate UV lamps.
 - 4. UV Intensity Sensors shall be deemed to have failed when:
 - a. UV Intensity Sensors are not able to be calibrated at the factory.
 - b. Duty Sensors drift out of calibration more than twice per month when checked with the reference intensity sensor per USEPA guidelines. Duty sensors shall be deemed out of calibration if

intensity value at 100 percent lamp power differs from reference sensor intensity value by more than 20 percent absolute value.

1.3 REFERENCES

- A. The following is a list of the references which may be found in this Section:
1. American Water Works Association (AWWA): F110-16 Ultraviolet Disinfection Systems for Drinking Water.
 2. American National Standards Institute (ANSI).
 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE): 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
 4. U.S. Environmental Protection Agency (USEPA): Final UV Disinfection Guidance Manual (UVDGM) - 2006 UVDGM.
 5. Water Research Foundation (WRF): Guidance Document for Testing Medium-Pressure UV Inactivation of Viruses. Project Number 4376 (latest version).
 6. National Fire Protection Association (NFPA): 70, National Electric Code (NEC).
 7. National Science Foundation (NSF) / ANSI:
 - a. Standard 60: Drinking Water Treatment Chemicals–Health Effects.
 - b. Standard 61: Drinking Water System Components–Health Effects.
 - c. NSF/ANSI 372, Drinking Water System Components - Lead Content.
 8. Underwriters Laboratory, Inc. (UL):
 - a. 50, Enclosures for Electrical Equipment, Non-Environmental Considerations.
 - b. 50E, Enclosures for Electrical Equipment, Environmental Considerations.
 - c. 508, Industrial Control Equipment.
 - d. 508A, Industrial Control Panels.

1.4 SUBMITTALS

- A. Shop Drawing:
1. List mechanical components of UV System and provide complete catalogue information, descriptive literature, specifications, and identification of materials of construction, including spare parts.
 2. Detailed UV reactor information including make/model, pressure rating, flange size, headloss curve, min/max validated and allowable flow rate, min/max validated and allowable UVT, min/max RED, min/max log inactivation, reactor support requirements, quantity/location of UV lamps and intensity sensors, cooling water requirements, lamp cool-down/warm-up requirements, and air-release/drain line connection details.
 3. Provide summary calculations to show compliance with the minimum required UV dose MS2 RED basis at the worst-case design conditions that

were utilized as the basis for the capital sizing of the UV System. Include the estimated action spectra correction factor (ASCF) based on latest published validation test results and UV reactor CFD modeling or lookup tables following WRF Guidance.

4. Provide maximum flowrate capacity for an individual UV reactor to achieve 2-log virus inactivation at 90, 92.5, 95, and 97.5 percent UVT, including estimated ASCF based on WRF Guidance.
5. Drawings showing plan layout, cross-sections, dimensions, critical clearances, installation requirements, and all interconnections and interface requirements (power, controls, instrumentations, etc.). Identify separately-mounted components, connections to other work, critical clearance requirements, interconnections and interface requirements, and the validated hydraulic configuration.
6. Provide all UV Equipment weights (dry and wet) and equipment anchoring criteria for design of structural support by Engineer.
7. Summary of UV System control strategy including UV dose equation or calculations as a function of flow, UVT, Validation Factor, target organism inactivation, lamp age/sleeve fouling factors, and action spectra correction factor. Provide graph or table of min/max RED as a function of flow, UVT, S/So, and ballast intensity.
8. Detailed description of instrumentation and control system, including a list of all functions monitored, controlled, and alarmed.
9. Input power voltage, frequency, and phase requirements, total system maximum power load, power quality thresholds, and ballast turndown capabilities. Include estimated heat load generated by each power/control panel at maximum power draw.
10. Specifications for all interconnecting cables between the UV equipment, including voltage ratings, insulation type, conductor material and cable/conductor outside diameter, maximum cable length, and cable terminator type and quantity.
11. A list of all replaceable system components along with their expected replacement frequencies, duration of life warranties, guaranteed replacement prices, and calibration frequencies. Include a list of special tools required for checking, testing, parts replacement, and maintenance.
12. Lamp data including watt rating, initial lumen output, lamp aging factors, and average lumens.
13. Complete description of the automatic lamp sleeve cleaning process and its maintenance requirements.
14. Validation Testing: Full, detailed report with third party signature, raw data, and documentation of all reactor performance validation testing per the 2006 Final UVDGM. Include completed versions of Checklists 5.1 through 5.5 of the 2006 Final UVDGM. Checklists shall be signed and dated by the UV Supplier. Provide summary of deviations from the 2006 Final UVDGM. Report shall be available for review by Owner, Engineer, and other officials deemed necessary.
15. Third-party certification of lamp aging factor and fouling factor.

16. Details of duty and reference UV intensity sensors including sensor traceability and uncertainty from linearity, temperature response, spectral response, angular response, and long-term drift. Include calibration requirements necessary for compliance with UVDGM requirements.
17. Process and instrumentation diagrams and description of all functions monitored, controlled, and alarmed.
18. Control system block diagram(s) including the Human Machine Interface (HMI(s)), Programmable Logic Controller (PLC(s)), and control networks. Proposed layouts and development of all HMI screens for control of the UV disinfection system.
19. Preliminary PLC ladder logic listings, input/output (I/O) printouts, and cross-referenced printouts documenting programmable controller software program.
20. Provide native format electronic copies of the software installed in UV Supplier's PLC and HMIs, annotated to carefully detail all program instruction functions and purposes. Minimum control, monitoring and alarm signals/information are detailed in the Functional Requirements paragraph in this Section.
21. Details of control and power panels including internal and external panel layouts, dimensions, access requirements, materials of construction, bill of materials, electrical schematics, and wiring diagrams. Include software and hardware component details.
22. Equipment delivery, storage, and installation requirements.
23. Preliminary Operation and Maintenance Manual.
24. Preliminary Operator Training Materials.

B. Quality Control Submittals:

1. Factory Acceptance Test Plan.
2. Final Factory Acceptance Test data sheets and witness report.
3. UV Supplier's Certificate of Proper Delivery for all UV Supplier supplied equipment.
4. UV Supplier's Certificate of Proper Installation for all UV Supplier supplied equipment.
5. Functional Test Plan: Provide a narrative of the test plan and data to be recorded and analysis to be completed, including all forms for recording data during the test.
6. Functional Testing Report: Provide a narrative and data summary of the Functional Testing discussing each element requiring testing, the tests performed, and the results. Functional Testing is not complete until this report is submitted and accepted by the Engineer.
7. Performance Test Plan: Provide a narrative of the test plan and data to be recorded and analysis to be completed, including all forms for recording data during the test.
8. Performance Testing Report: Provide a narrative and data summary of the Performance Testing discussing each element requiring testing, the tests

performed, and the results. Performance Testing is not complete until this report is submitted and approved by the Engineer.

- C. Contract Closeout Submittals:
1. Final Operation and Maintenance Manuals as specified in the General Requirements.
 2. Final Operator Training Materials.
 3. List of all original equipment by model and part number (detailed bill of materials). List manufacturer names, addresses, and phone numbers.
 4. Provide Final PLC and Operator Interface programs on a flash drive. in Rockwell Automation native format.
 - a. Fully documented ladder logic listings, function listing for function blocks not fully documented by ladder logic listings, cross-reference listings and operator interface configuration documentation.
 5. Service records for maintenance or calibration reports for calibration performed during construction or testing activities.

1.5 SPARE PARTS & MATERIALS

- A. Provide the following spare parts:
1. UV Lamps: One complete set for one reactor.
 2. Sleeves: One complete set for one reactor.
 3. Ballasts: One complete set for one reactor.
 4. Ballast Cooling Fans: One complete set for one reactor.
 5. Duty UV Sensors: One complete set for one reactor.
 6. Reference UV Sensors: Three (3) Sensors total for facility.
 7. Complete set of cleaning system wiper assemblies for one reactor.
 8. Complete set of special tools to disassemble or adjust the UV System.
 9. Complete set of O-rings seals for one reactor.
 10. One year's supply of cleaning chemicals or cleaning system parts, (if applicable).
 11. Spare Fuses: One of each size and type provided.
 12. Spare parts for programmable controllers:
 - a. One of PLC processor used.
 - b. One of each type of I/O module used.
 - c. One of each type of mounting chassis used.
 - d. One of each type of communications module used.
 13. Three (3) pairs of eye protective goggles and gloves.

1.6 SHIPPING, HANDLING, & STORAGE

- A. As much as practicable, equipment shall be factory assembled. The equipment parts and assemblies that are, of necessity, shipped unassembled shall be furnished with an assembly plan and instructions. The separate parts and

assemblies shall be match-marked or tagged in a manner to facilitate field assembly of the equipment.

- B. Generally, machined and unpainted parts subject to damage by the elements shall be protected with an application of a strippable protective coating.
- C. Equipment shall be packaged or crated in a manner that will protect equipment from damage during shipping handling, and storage.
- D. The outside of the package or crate shall be adequately marked or tagged to indicate its contents by equipment name, Contract number, and equipment number if applicable; approximate weight; state any special precautions for handling; and indicate the recommended requirements for storage prior to installation.
- E. Spare parts and special tools shall be properly marked to identify the associated equipment by name, equipment, and part number. Parts shall be packaged in a manner for protection against damage from the elements during shipping, handling, and storage. Spare parts and special tools shall be shipped in appropriately sized, hinged-cover, wood or metal boxes. The boxes shall be marked to indicate the contents and use. Delivery of special tools shall be made prior to the time the associated equipment is scheduled for the initial test run.
- F. Unloading equipment at the jobsite shall be by Installing Contractor, and shall be responsible for ensuring equipment and materials to assist with the unloading are available at the time of delivery. Contractor shall indicate the estimated delivery on the Construction Schedule and subsequent updates. Contractor shall provide Owner and Engineer with at least a 48-hour notice prior to the expected delivery time to the site. Contractor shall coordinate with Owner, Engineer, and plant staff for the delivery, which shall be during regular daytime working hours at the treatment facility, and ensure the delivery does not interfere or impact other deliveries either for the Contractor or, more importantly, plant operations.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Products that will be in contact with potable water shall have NSF 61 certification. Chemicals used by the UV Supplier shall have NSF 60 certification.
- B. The complete electrical assembly shall meet all requirements of the National Electrical Code (NEC), the National Electrical Manufacturers Association (NEMA), the National Fire Protection Association (NFPA), and all applicable local electrical codes.

- C. Components, including equipment, coatings and other parts of the UV System, shall comply with American Water Works Association (AWWA) standards, unless specified otherwise.
- D. All terminal point connections shall be ANSI standard flanges.

2.2 DESIGN CRITERIA

- A. The existing water treatment system at the Taylor Mill Treatment Plant located at 608 Grand Avenue in Taylor Mill, Kentucky. The TMTP is a surface water treatment facility with conventional coagulation, sedimentation, and filtration. The raw water is pumped from the Licking River, which is a tributary of the Ohio River.
- B. The new UV System will be located downstream of the dual media filtration system. Filter effluent water (<0.3 NTU) would flow through the UV reactor. Any chemical addition for finished water is downstream of the UV reactor.
- C. The new UV System will be installed in the Main Filter Building downstream of conventional sedimentation/filtration. Refer to Plans for additional information and details.
 - 1. There are two existing UV systems and both shall be removed as part of this work. All existing equipment is currently located in the basement of the Main Filter Building.
 - 2. Only one new UV system shall be installed to replace one of the existing UV systems.
 - 3. The new UV Control and Power Panels (CPPs) will be installed in the Break Room on the first floor of the Main Filter Building (roughly one floor up from the existing CPPs, which will also be removed from service).
 - 4. Remove existing power and signal conduit and wiring, and install new power and signal conduit and wiring.
 - a. Contractor shall be responsible for furnishing and installing new conduit and wiring between new equipment and components to the CPP and the new remote HMI panel as well as wiring up to Main Plant SCADA panels, and making final connections to Main Plant SCADA panels. Contractor shall be responsible for programming in CPP to HMI panel and new UV system equipment.
 - b. Owner will be responsible for required modifications to Main Plant SCADA, including programming.
 - 5. Likewise, existing piping, valves, and appurtenances shall be reused to the greatest extent possible although some new piping and appurtenances will need to be furnished and installed to complete the work.
 - 6. The temperature in the Break Room is expected to be maintained between 60 and 80 deg F. The temperature in the basement is expected to be maintained between 50 and 80 deg F.

7. Although it will need to be field verified, the estimated maximum length between the UV reactor and UV power/control panels is 100 feet.
 8. The existing UPS system and panels, including batteries, conduit and wiring, are to be removed from service when all of the existing UV systems are no longer in service. The new UV system will not require a UPS system as it will be interconnected with the water plant's emergency generator systems.
 - a. Contractor shall confirm with Owner the status of the emergency generator systems project or other work that may or may not have an impact on the UV system work.
 9. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
- D. Provide UV System meeting the following design basis:
1. Total Number of UV Reactors: 1 active reactor
 2. Current UV System Flow: Minimum: 3 mgd
Average: 6 mgd
Maximum: 12 mgd
 3. Reactor Flange Size: 24-inch
 4. Water Temperature Range: 36 to 85 deg F
 5. Turbidity (NTU): Maximum: < 0.3
 6. Design UV RED: As required to meet pathogen performance
 7. UV Transmittance @ 254 nm: Minimum: 90 percent
Average: 95 percent
Maximum: 99 percent
 8. Pathogen Performance: 3.0 log Inactivation (min) Cryptosporidium
3.0 log Inactivation (min) Giardia
- E. Under the USEPA 2006 Final UVDGM, UV reactor shall be validated to provide minimum pathogen inactivation requirement over the full range of flows, UV dose, and water characteristics at the end of lamp life and under fouled quartz sleeve conditions. Validated operating conditions for each UV reactor shall include UVT less than or equal to 70 percent, flowrate greater than or equal to 20 mgd, and log inactivation of Cryptosporidium and Giardia greater than or equal to 3.0.
- F. Validation Testing shall be compliant with the 2006 Final UVDGM. Checklists 5.1 through 5.5 of the 2006 Final UVDGM shall be submitted to show level of compliance with the 2006 Final UVDGM.
- G. The UV System shall be programmed, consistent with the 2006 Final UVDGM, such that UVT greater than the maximum validated UVT shall be considered equal to the maximum validated UVT and flowrates less than the minimum validated flowrate shall be considered equal to the minimum validated flowrate in the UV System programming and dose calculations. No extrapolation of system performance shall be allowed.

- H. UV Design Dose for UV System Sizing:
1. Reactors must produce a Validated Dose (Dval) equal to or greater than 40 mJ/cm². The calculated Reduction Equivalent Dose (RED) at the design conditions must be greater than the product of the required dose (e.g., 40 mJ/cm² for 3.0-log *Cryptosporidium*) and the validation factor (VF) calculated per the 2006 Final UVDGM for *Cryptosporidium* based on MS-2 bacteriophage.
 2. Each UV reactor shall be sized to meet the minimum disinfection requirements for all design conditions below:
 - a. Flowrate of 12 mgd or greater at 90 percent UVT, including ASCF based on WRF Guidance.
 - b. Flowrate of 12 mgd or greater at 95 percent UVT, including ASCF based on WRF Guidance.
 - c. Flowrate of 12 mgd or greater at 97 percent UVT, including ASCF based on WRF Guidance.
 3. The product of the end of lamp life aging factor (ELAF) and the quartz sleeve fouling/aging factor (QSFF) shall be incorporated into the UV design dose.
 4. The ELAF provided by the UV Supplier shall be based on the 3rd party verified lamp output as a fraction of specified new lamp output after 100 hours of operation. The maximum ELAF allowed is 0.95. If no 3rd party certification is submitted the ELAF shall be no higher than 0.90.
 5. If an alternate end of lamp aging factor is used, third-party certification (signed by a registered professional engineer) of the factor and the conditions under which it was determined shall be provided.
 6. The QSFF shall be no greater than 0.90 for UV Systems with automatic cleaning mechanism. Third-party certification (signed by a registered professional engineer) of the factor and the conditions under which it was determined shall be provided.
 7. The ASCF for any surrogate organism used in validation of a medium-pressure lamp reactor shall be based on WRF Guidance for initial UV System sizing. Supporting documentation shall be provided to show ASCF estimation using CFD basis, consistent with WRF Guidance. If estimation of the ASCF based on WRF Guidance is not provided, a default value of 1.50 shall be used for all conditions.
- I. UV Reactor Headloss: Maximum of 24 inches measured from inlet to outlet flange at maximum reactor design flow rate.
- J. Input Voltage: 480 Volts Alternating Current (VAC), 60 Hz, 3-phase, 3-wire. UV System shall be capable of operating during a 30 percent voltage drop from nominal, without shutting down. UV System shall be capable of operating during an 8 millisecond voltage drop without shutting down.

- K. All reactor components shall be designed to handle pressures of up to 150 psig and shall be fully assembled and hydrotested at 1.5 times the design pressure at the factory prior to shipment.
- L. The UV System shall be comprised of the following components:
 - 1. UV Reactor(s) including lamps, quartz sleeves, and appurtenances.
 - 2. Calibrated UV Intensity sensor(s):
 - a. One (1) duty intensity sensor required per lamp for medium-pressure UV Systems.
 - b. Reference UV sensor: refer to Section 1.5, Spare Parts & Materials. The UV System shall be able to continue providing disinfection while the UV intensity sensor is being calibrated or checked for calibration.
 - 3. Automatic Cleaning System:
 - a. One required per UV reactor.
 - b. The UV System shall be able to continue providing disinfection while the automatic cleaning system is in operation.
 - 4. Local UV Reactor Control/Power Panel(s):
 - a. One required per UV reactor.
 - b. Includes lamp ballasts, controller, remote I/O panels, HMI, and interconnecting power and control wiring between UV reactor and local control/power panel.
 - c. The estimated total distance between the UV reactor and UV power/control panels roughly 100 feet. Contractor shall field verify actual distance based on approved layout.
 - 5. Remote UV Reactor HMI(s):
 - a. One (1) required per UV reactor.
 - b. Provides an additional operator interface near the UV reactor.
 - c. Located adjacent to UV reactor affixed to an independent support panel as shown on Contract Drawings.
 - 6. UV Transmittance (UVT) Monitor:
 - a. Two (2) required.
 - b. As specified herein to provide continuous UVT measurement for UV dose control.
 - c. Located in the Main Filter Building basement in the same area as the UV Reactor.

2.3 UV SUPPLIERS

- A. Materials, equipment and accessories specified in this section shall be products of:
 - 1. DeNora Water Technologies (UV Technologies Division of Calgon Carbon Corporation).
 - 2. or Owner and Engineer approved equal.

2.4 UV SUPPLIER SCOPE OF SUPPLY

- A. The UV System shall be furnished by the UV Supplier, complete with all validated UV reactors, UV reactor power supplies, power cables between the power panels and the reactors, power supply line filters (if required), transient voltage surge suppressors (if required), lamp power ballasts, power supply transformers (if required), lamps, quartz sleeves, calibrated duty and reference UV sensors, automatic cleaning system, cleaning chemicals (if applicable), electrical and control wiring and programmable controllers within the UV reactor and power/control cabinet(s), UV transmittance analyzers and flow elements, UV reactor temperature and level switches, UV reactor remote HMIs, UV system master control panel/HMI for a complete and operable UV System.

2.5 SCOPE OF SUPPLY FOR CONTRACTOR

- A. Owner will be responsible for updating and/or modifying the Main Plant SCADA, including programming in the Main Plant SCADA.
- B. Contractor shall install all signal wiring and conduit for the new equipment appurtenances to the UV control/power supply panels (CPP) in the first floor break room. Install new CAT 6 ethernet cable from the CPP to the Main Plant SCADA. Contractor shall be responsible for labelling and tagging all new conductors in/out of CPP as well as programming for the CPP. Contractor shall size conduit for 150% of the number of conductors required for operations. Contractor shall be responsible for supplying and installing all the necessary materials, equipment and appurtenances not supplied as part of the scope of supply for the UV System, but required for a complete, functional and operational UV System including, but not limited to:
 - 1. Structural supports required to install the UV reactors, piping, and remote UV system HMIs.
 - 2. UV reactor and UV train air relief valves, isolation valves, pressure gauges, and associated piping as shown on Contract Drawings.
 - 3. All the hardware, fasteners, anchor bolts, nuts, plates and angles necessary for the installation of the UV System. All hardware, fasteners, anchor bolts, nuts, plates, angles, etc., shall be Type 316 stainless steel.
 - 4. All mating flanges, insulating flanges, couplings, gaskets, bolts, nuts, and all necessary piping specialties to install the reactors, and analyzers, supplied by the UV Supplier. Mating flanges shall be as required in the pipe schedule. All bolts, nuts shall be Type 316 stainless steel. Gaskets shall be ethylene propylene diene monomer rubber (EPDM).
 - 5. All conduit, fittings, supports, hubs and wiring including wire terminations and terminators necessary for the complete installation of the UV reactors, CPPs, instruments, analyzers, devices and HMIs supplied as part of the UV System. This includes any additional length of conduit/wiring required to meet actual installation requirements.

6. All the equipment supports, U-bolts, piping/valves and all necessary hardware to install all the ancillary equipment supplied by the UV Supplier. Ancillary equipment shall include analyzers, control and power panels, and other equipment needed for a fully functional and validated UV System.
 7. Provide on-site assistance to UV Supplier during Functional Testing and Performance Testing as defined in the Performance Test Procedures developed by the UV System Supplier and approved by the Engineer. Develop UV System testing schedule that is compatible with overall projects needs for which UV Supplier shall follow. Coordinate with Owner regarding availability of process water and flowrate.
- C. Contractor shall refer to the UV Supplier's Submittal's for additional requirements.
- D. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.

2.6 UV REACTOR

- A. General Requirements:
1. Materials of Construction: The UV reactor shall be welded Type 316L stainless steel, pickled, passivated, and bead blasted for uniform external finish. Final external reactor finish shall be a No. 4 finish as defined by the Specialty Steel Industry of North America. Each reactor shall be supplied with American National Institute (ANSI) Class 150 flanged inlet/outlet connections. All metal parts in the reactor shall be constructed of Type 316L, pickled and passivated stainless steel. All nonmetallic materials in the reactor shall be suitable for continuous exposure to UV light.
 2. Quartz sleeves shall be high purity, rated for maximum possible UV transmittance, and accounted for in UV dose and validation.
 3. Each lamp shall be enclosed in an individual quartz sleeve, sealed with compressed O-rings.
 4. Each quartz sleeve shall be independently sealed within the reactor.
 5. The UV reactor shall be designed such that the Utility operating personnel can change the lamps without draining the reactor.
 6. The UV reactor shall be provided with an access port for easy maintenance of the quartz sleeves, cleaning system, and sensor calibration and maintenance.
- B. UV Lamps:
1. The UV lamps shall be medium-pressure (MP).
 2. The filament shall be rugged to withstand shock and vibration.
 3. The lamp bases shall be resistant to UV.
 4. The lamps shall be operated by electronic or electromagnetic ballasts with multiple power settings ranging from at least 40 percent to 100 percent

maximum power using at least 2 percent power steps as validated conditions.

- a. The estimated maximum length between the UV reactor and UV power/control panels is 100 feet. Contractor shall field verify actual distance based on approved layout.
5. The UV lamps shall be guaranteed for a minimum number of operation hours prior to lamp output reaching the ELAF. A minimum of four on/off cycles shall be allowable for the lamps every 24 hours. At the end of guaranteed lamp life, lamp output weighted for the germicidal emission spectrum (using a weighting equivalent to that used by the UV Supplier's intensity sensor), shall be greater than or equal to 90 percent of new lamp output, as measured in the field by the Utility using the UV System's UV intensity reference sensors. Thus, lamp life shall be determined by field tests based on intensity sensor readings. At the highest power setting, if the intensity reference sensor reading (or average of all reference sensors) for a clean lamp is less than or equal to 90 percent of the intensity sensor reading(s) for a new lamp, then the end of lamp life shall be considered to have been achieved. If the UV Supplier submits an alternative ELAF, then the submitted value shall replace "90 percent" in the previous text.
6. Manufacturer's unit cost for replacement lamps shall include cost to accept and properly dispose of used lamps.

C. UV Lamp Quartz Sleeves:

1. Manufacturer:
 - a. General Electric Type 214, fully annealed clear fused quartz tubing.
 - b. General Electric Type 021A, dry synthetic clear fused quartz tubing.
 - c. General Electric Type 219, doped quartz tubing.
 - d. or approved equal.
2. The open end(s) of the lamp sleeve shall be sealed by means of an O-ring and Type 316 stainless steel compression plate.
3. The UV lamp sleeves shall be guaranteed for a number of operation years, as specified hererin. At the end of guaranteed sleeve life, sleeve output shall be greater than or equal to 90 percent of new sleeve output immediately after sleeve cleaning.

D. UV Intensity Sensor(s):

1. Only germicidal UV sensors, as defined in the UVDGM, shall be allowed.
2. A minimum of one duty UV sensor is required per MP lamp.
3. "Wet" Intensity Sensors shall not be used.
4. Supplier shall guarantee the duty UV intensity sensor calibration interval. If the time between calibrations for a duty UV intensity sensor is less than the guaranteed calibration interval, Supplier shall calibrate the sensor at no cost to the Utility, and shall pay for all sensor shipping charges to and from the Owner. Determination of a sensor requiring calibration shall be

according to the Supplier's standard operating procedures. This guarantee shall apply for a period of 20 years, or until UV intensity sensors that meet the guaranteed calibration interval are provided by Supplier, whichever is later.

- E. Automatic Lamp Sleeve Cleaning System:
 - 1. Each UV reactor shall be equipped with an automatic quartz sleeve cleaning system.
 - 2. The cleaning system shall provide cleaning abilities for the lamp sleeves and UV sensor.
 - 3. Automatic cleaning systems shall be:
 - a. Fully operational while still providing disinfection.
 - b. Complete with an automatically initiated and controlled cleaning cycle.
 - c. Field adjustable timing via the operator interface.
 - d. Manual cleaning system operator control shall be available through the operator interface.
 - 4. Cleaning system components used shall be NSF 60 approved.

2.7 UV SYSTEM CONTROL PANELS

- A. General:
 - 1. All panels shall be pre wired to the maximum extent possible, requiring only field connections for power and field devices. For communication circuits, provide cable and connectors per device manufacturer's recommendations. Provide measurements to certify that lead length limitations on communication circuit cabling have not been exceeded.
 - 2. Control Panel Fabrication:
 - a. UL Listing Mark for Control Panels: Mark stating "Listed Enclosed Industrial Control Panel" per UL 508A.
 - b. Panel construction and interior wiring in accordance with NFPA 70 (NEC), state and local codes, NEMA, ANSI, UL, and ICECA.
 - c. All electrical components are to be isolated from all wetted parts.
 - d. The components shall be arranged in the enclosure such that failure of any component requires the removal of the failed component only. Systems where groups of components are enclosed and serviced as a sub-system will not be permitted.
 - e. Panels shall be constructed to accommodate all necessary accessories such as instrument air, power, power supplies, mounting hardware, terminal blocks and any signal conditioning or conversion equipment that may be necessary to make operational all monitored and controlled equipment mounted in the enclosure.
 - f. Panel layout and equipment spacing shall be constructed to allow for device removal, calibration and maintenance without disassembly of adjacent devices.

- g. Removable "eye" bolts shall be provided to facilitate sling handling of each panel. In lieu of eye bolts, the panels can be mounted to a single frame that can be lifted by a sling. If used, eyebolt mounting shall be a part of the structural support bracing to distribute stresses and enclosure weight while sling handling enclosures during installation.
- h. All panels shall have sufficient structural reinforcements to ensure a plane surface, limit vibration and to provide rigidity during shipment, installation and operation without distortion or damage to the control panel enclosure or injury to any mounted instruments.
- i. All panel seams shall be continuously welded and ground smooth to be undetectable after painting.
- j. All enclosures shall be provided with flush hinges and an automotive-type latch.
- k. Enclosure doors shall have three-point latch assemblies, or quarter turn latches.
- l. All control panels containing PLCs or HMIs shall be supplied with print pockets, located on the inside bottom of the control panel enclosure door. Make and color of the print pocket shall be the same as the control panel enclosure interior.
- m. There shall be no devices installed on the side plates of the control panel enclosure.
- n. Devices mounted on the front door of the control panel enclosure front door shall be installed rigidly and within view level heights. The center of the HMI shall be installed at approximately 5 feet above surrounding floor for ease of operation. Other devices such as selector switches, pushbuttons and indicating devices arranged below it.
- o. Instruments or devices furnished for mounting on the front of the control panels shall be suitable for this application and selected to match each other and present a coordinated aesthetically pleasing functional arrangement. The arrangement of devices is to be as symmetrical as possible and shall functionally group devices to enable operators to easily locate groups of devices or individual devices to control the process.
- p. All control panels should have a total clearance of not less than 2 inches from the face of any backplate mounted devices to the rear of any door mounted devices.
- q. Other than the control panel front, under no circumstances shall an enclosures external surface be perforated for the purpose of mounting enclosure components (both internal and external) without the express prior permission of the Engineer. Enclosure components requiring such fixation shall utilize fusion welded capacitor discharge type studs.

- r. Control wiring within each panel shall be segregated within the panel based on voltage. All voltages above 120V shall be separated by a solid metal barrier. Analog and discrete control wiring shall be kept separate from 120V ac and 480V ac and higher. Wiring shall be, minimum, No. 14 AWG for 120V ac control wiring and No. 16 AWG for analog wiring. In all cases, size wire for connected loads and include calculations for verification, showing appropriate derating, where needed.
 - s. All control panel doors shall open through 180 degrees without restriction.
 - t. Internal back panel is to be removable type, mounted 2 inches clear from rear of the panel.
 - u. Digital, analog and power devices such as relays, terminals and wire must be separated and clearly marked.
3. Control Panel Wiring:
- a. Hinge Wiring: Secure at each end so that bending or twisting will be around longitudinal axis of wire. Protect bend area with sleeve.
 - b. Arrange wiring neatly, cut to proper length, and remove surplus wire.
 - c. Abrasion protection for wire bundles which pass through holes or across edges of sheet metal.
 - d. Connections to Screw Type Terminals:
 - 1) Locking-fork-tongue or ring-tongue lugs.
 - 2) Use manufacturer's recommended tool with required sized anvil to make crimp lug terminations.
 - 3) Wires terminated in a crimp lug, maximum of one.
 - 4) Lugs installed on a screw terminal, maximum of two.
 - e. Connections to Compression Clamp Type Terminals:
 - 1) Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.
 - 2) Wires installed in a compression screw and clamp, maximum of one for field wires entering enclosure, otherwise maximum of two.
 - f. Splicing and tapping of wires, allowed only at device terminals or terminal blocks.
 - g. All terminal blocks, relays and other wiring and devices shall be installed on the panel backplate.
 - h. Terminal blocks shall be supplied and installed for all used and spare PLC I/O points.
 - i. Terminate 24V dc and analog signal circuits on separate terminal block from ac circuit terminal blocks.
 - j. Separate voltages higher than 120 V ac in separate wire ducts or conduit.
 - k. Separate analog and dc circuits by at least 6 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.

1. All internal control panel wiring shall run through plastic wire ducts. Do not exceed manufacturer's fill recommendation.
4. Internal Panel Lights for Control Panels:
 - a. Type: 120 V ac Switched LED with door switch.
 - b. Quantity: One light for every 4 feet of panel width.
 - c. Mounting: Inside and in the top of back-of-panel area.
5. Service Outlets for Control Panels:
 - a. Type: Three-wire, 120 volt, 15 ampere, GFCI duplex receptacles in ivory or white, with 5 ampere circuit breaker branch protection.
 - b. Quantity: One outlet for every 4 feet of panel width.
 - c. Mounting: Evenly spaced along back-of-panel area.
6. Control Panel Cooling and Heating:
 - a. Maximum Temperature: All control panels shall have ample cooling to prevent high temperatures from shortening the life of the equipment mounted inside. No location within the control panel or the interior of the equipment mounted inside shall reach temperatures higher than 104 deg Fahrenheit.
 - b. Minimum Temperature: All control panels shall have sufficient electric heating to prevent low temperatures from causing condensation on and/or freezing of equipment mounted inside. No location within the control panel or the interior of the equipment mounted inside shall reach temperatures below 41 deg Fahrenheit.
 - c. Ventilated Panels:
 - 1) Furnish with louvers and forced ventilation as required to prevent temperature buildup from equipment mounted inside panel or on panel.
 - 2) Louver Construction: Stamped sheet metal.
 - 3) Ventilation Fans:
 - a) Furnish where required to provide adequate cooling.
 - b) Create positive internal pressure within panel.
 - c) Fan Motor Power: 120V ac, 60 Hz, thermostatically controlled.
 - 4) Air Filters (if provided): Washable aluminum, Hoffman Series A FLT, or Engineer approved equal.
 - d. Cooling Without Air Exchange: Control panels in areas of heavy particulate contamination shall be cooled without air exchange between the interior and the exterior of the control panel. Either solid-state cooling equipment or refrigeration must be used to cool the control panel. The heat dissipation portion of the cooling unit shall be designed for use in areas with heavy particulate contamination and shall be capable of running extended periods without cleaning.

B. Local Control/Power Panels (CPP):

1. All electrical components are to be housed in painted steel, NEMA 12 or greater rated enclosures.

2. All control panel enclosure exterior surfaces to be factory finished, powder coated ANSI/NSF 61 grey. Control panel enclosure interiors and sub-panel shall be gloss white.
3. Coordinated breaker protection required from UV System control and power panel sections.
4. All CPPs shall be provided with electrical safety interlocks, which prevent the panel from being opened when the main panel electrical disconnect is closed (providing power to the panel). Alternatively, an interlock may be provided to disconnect power from the panel when the door is opened. Safety interlock shall be Cutler-Hammer Flex Shaft, or Engineer approved equal.
5. Provided electrical safety interlocks shall be in full compliance applicable panel ratings (e.g., ULc), local ordinances and requirements as well as NKWD requirements.
6. Emergency stop pushbuttons: Each CPP is to have a push-to-stop, pull-to-reset, large diameter red mushroom head, heavy-duty, NEMA 12 pushbutton.
 - a. Manufacturer: Allen Bradley Type 800T.
 - b. or equal.**
7. Power distribution and control for each UV reactor shall be through the associated CPP. The CPP shall house all power supplies and control hardware for the reactor.
8. Electrical cables must have jackets that will not degrade after prolonged exposure to UV light.
9. Provide cables for connecting the UV reactor to its associated CPP. Cable shall be rated for the proper power and temperature operating conditions. CPPs and reactors shall be installed in the same building, as shown in preliminary design drawings. Cables will be routed between UV reactors and CPPs via exposed cable trays and/or conduits. Maximum cable length is estimated to be 72 feet each. If conduit length exceeds 72 feet, Installing Contractor is responsible for providing the additional length required to complete the installation.
10. The CPP shall include all control power transformers for all required voltages. Provide a complete power distribution system for the ballasts/lamps and ancillary equipment associated with each reactor. The electrical system shall comply with all local electrical code requirements.
11. Total harmonic distortion, both voltage and current, shall not exceed 5 percent from root-mean-square, and individual harmonics do not exceed 3 percent from root-mean-square, at the input terminals of the panel.

C. Remote Control Panel:

1. All electrical components are to be housed in 316 stainless-steel, NEMA 4X or greater rated enclosures. Control panel enclosure interiors and sub-panel shall be gloss white.

2. Emergency stop pushbuttons: Each remote control panel is to have a push-to-stop, pull-to-reset, large diameter red mushroom head, heavy-duty, NEMA 4X pushbutton.
 - a. Manufacturer: Allen Bradley Type 800H.
 - b. or equal.

2.8 PLANT SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) PLC

- A. Remote control of the UV system shall be allowed through the Main Plant SCADA PLC. The following functions will be provided by the Owner from the Main Plant SCADA to the CPP:
 1. Digital Control: UV system Run (Request), UV System Stop (Request), Sequence Mode Selection, along with general functions (general warning alarm reset, etc.).
 2. Analog Control: Required Flow and Required UV Dose.
- B. Signal Wiring and Conduit
 1. Contractor shall coordinate work with the Owner prior to the start of demolition work.
 2. Owner will be responsible for required integration/programming of the Main Plant's SCADA system.
 3. Contractor shall be prepared to remove all existing UV system signal wiring and conduit back to the Main Plant SCADA in the Operator Control Room of the Main Treatment Building (2nd floor).
 4. The new UV Power Supply/Control Panels (CPP) will be located on the 1st floor of the Main Treatment Building. The UV reactor and remote HMI panel will be located in the basement of Main Treatment Building.

2.9 INSTRUMENTATION AND CONTROL

- A. Instrumentation and Controls – General:
 1. One new CPP shall be provided for the new UV reactor. All control hardware and software for a given reactor is contained within the associated CPP.
 2. Provide instrumentation and control for the UV System, which allows for the UV disinfection process to be fully automated and deliver the required UV dose under conditions of varying flow rates, UV lamp intensity and varying UV transmittance. This shall include the new remote HMI panel near the new UV reactor unit.
 3. The Owner would prefer to have the option to have the most current versions of instrumentation and control components that are available. Contractor shall advise Owner if specified components have a more current version available and the option to have furnished and installed.
 4. The Contractor shall advise the Owner and Engineer in advance if the proposed PLC and HMI are manufactured by a firm other than Allen-Bradley (A-B). The Owner can incorporate A-B components into their

current SCADA systems and have the licenses to do so along with the training and experience. If the PLC and HMI are to be from a manufacturer other than A-B, then, at the Contractor's expense, the Contractor shall also be responsible for furnishing the Owner the required licenses to integrate, operate, and maintain the systems as well as training specifically on the PLC and HMI for the Owner's personnel.

- B. Make all program functions, I/O addresses and internal registers within PLCs accessible by the Main Plant SCADA system. Coordinate all register units, ranges and conventions with Installing Contractor's System Integrator to facilitate data exchange. The graphic display screens for the UV System HMIs shall match the color usage configuration of the plant SCADA workstations for valve and equipment status. The color green shall be used to indicate a valve is opened or equipment is running. The color red shall be used to indicate a valve is closed or equipment is stopped. The color yellow shall be used indicate a valve is mid travel. General formatting and screen navigation shall be manufacturer standard.
- C. Programmable Logic Controllers (PLCs):
 - 1. A controller consists of a power supply, rack, processor module, communication module, I/O modules, removable terminal blocks, slot fillers, and other hardware, as required for a complete and functional system.
 - 2. Quantity:
 - a. One (1) controller shall be mounted in local CPP.
 - 3. Communications Modules: Provide 100/1000 Mbps EtherNet/IP communications channels. Utilize 10/100 Mbps Ethernet communications for all HMIs and to plant SCADA. MOXA, Inc. is preferred.
 - 4. Power Supply Module: As required.
 - 5. Digital Input Module: As required with isolated inputs.
 - 6. Digital Output Module: As required with isolated relay outputs.
 - 7. Analog Input Module: As required with isolated 4-20 mA inputs.
 - 8. Analog Output Module: As required with isolated 4-20 mA or 0-10VDC outputs.
 - 9. Design Requirements:
 - a. Furnish a removable terminal block (RTB) for each I/O module.
 - b. Each chassis shall accommodate a minimum of two future additional I/O modules as shown in the PLC Input and Output List.
 - c. Furnish module slot fillers to reserve module slots for future I/O modules.
 - d. Each I/O module type used shall accommodate a minimum of 20 percent spare I/O points of the total installed I/O points as shown in the PLC Input and Output List, but no less than two spare I/O of each type of I/O module used.
 - e. Furnish one communication module for connection to plant SCADA network.

- f. Furnish one communication module for connection to controller I/O network as required. I/O network traffic shall be separate from plant SCADA network traffic.
 - 10. Manufacturers and Products:
 - a. Allen-Bradley; ControlLogix L8 or CompactLogix L33 controllers and associated hardware.
 - b. or equal.
- D. Human-Machine Interface Unit (HMI):
 - 1. Panel-mounted graphical operator interface capable of bi-directional communication with PLC-based control system.
 - 2. Quantity:
 - a. One (1) HMI shall be mounted in each local CPP.
 - b. One (1) HMI shall be mounted in each remote control panel.
 - 3. Include all cables necessary to interface with the PLC control system and to a personal computer.
 - 4. Manufacturers and Products:
 - a. Allen-Bradley; PanelView Plus 7 with touch screen only.
 - b. or equal.
- E. Control System Hierarchy
 - 1. The UV SUPPLIER will apply through hardware, and PLC/HMI software, the following standard control hierarchy/modes to all plant SCADA controlled devices:
 - a. LOCAL – When a controlled device's physical. LOCAL/REMOTE switch is placed in LOCAL, an operator has direct control over each device by means of its physical controls, situated at the device. This mode prevents all SCADA Manual and Automatic control functions. Under all control modes, the SCADA system retains device status monitoring functions. Switching between LOCAL and REMOTE shall be bumpless (retaining the last operational status).
 - b. REMOTE MANUAL (MANUAL) – When the device's physical LOCAL/REMOTE switch is placed in REMOTE, device control has been turned over to the SCADA system, disabling all local controls, except emergency stop and safety related control functions such as hardwired interlocks. A device's AUTO/MANUAL control mode state is retained within its controlling PLC, switchable by software means through HMI based controls. MANUAL software controls mimic the device control features available locally at the device, allowing direct remote control over individual devices. Under normal circumstances, switching between MANUAL and AUTO shall be bumpless, unless the current process state satisfies the pre-defined AUTO control conditions, in which a device or set of devices may start or stop immediately.

- c. REMOTE AUTO (AUTO) - With the device's LOCAL/REMOTE physical switch remaining in the REMOTE position and its SCADA based control placed in AUTO, a device or a set of associated devices in a larger process unit, will be automatically controlled by logic and associated setpoints within the PLC(s), generally without user intervention. MANUAL controls are disabled. Switching between AUTO and MANUAL shall be bumpless.
 - d. Operator is to have the capability of start/stop equipment set in Manual control mode.
 - e. Operator is to have the capability adjust control setpoints and parameters of equipment set in AUTO control mode.
 - f. Operator is to have the capability to open/close valves or adjust the position when applicable.
 - g. Provide safeguards and warnings to prevent an accidental change of state.
2. Functional Requirements:
- a. The UV System shall calculate the UV reduction equivalent dose based on the flowrate through the reactor, the UV transmittance, and the UV intensity measurements in the reactor. The UV System shall apply the Validation Factor and ASCF (calculated if required) and report the Validated Dose and Log Inactivation of Giardia and Log Inactivation of Cryptosporidium. The UV reactor flowrate shall be hardwired to the CPP's PLC from the flow meters (by others). The UV transmittance signal shall be hardwired to the Local UV System PLC and distributed to the individual UV reactor PLCs (by UV System Supplier).
 - b. The UV System shall maintain the required UV dose and log inactivation and send an alarm to the plant SCADA if it is unable to maintain the dose and log inactivation set points.
 - c. The UV System shall monitor for equipment failure or malfunction and shut down the reactor in response to such a failure. The CPP face shall be provided with an emergency STOP pushbutton, which upon activation will shut down the reactor and send the shutdown signal to the plant SCADA.
 - d. A permissive to start a UV reactor will be provided by the plant SCADA. If permission is given, the UV reactor shall be allowed to warm-up.
 - e. Control and monitoring of the UV reactor effluent flow control valves are to be done by the UV System PLC inlet and outlet train. The UV Supplier shall coordinate with the Installing Contractor regarding details of interfacing and communications with this equipment. The valves shall be programmed to prevent flows greater than the maximum allowable or maximum validated flow defined by the UV Supplier.

- f. Utilize a non-linear filter to adjust lamp power during rapid changes in flow or UVT to avoid short-periods of off specification water.
- g. Send a request to OPEN UV to Waste Valve and CLOSE after lamp break/leak critical alarm.
- h. The UV Reactor influent valve shall be opened prior to firing lamps, to allow for cooling water during start-up and is typically only closed for maintenance.
- i. The UV reactor effluent flow control valve shall not be opened until warm-up cycle has finished and a SYSTEM READY signal is received from the UV reactor CPP.
- j. In order to provide coordination and synchronization between the alarm displays on both the UV System HMIs and the plant SCADA system, both the UV Supplier and the Installing Contractor's System Integrator will provide sufficient synchronization mechanisms and logic within their systems such that all UV System HMI and SCADA alarm display and acknowledgement maintains synchronization.
- k. As a minimum, the UV System shall provide the process monitoring and status information to the plant SCADA as listed in the following sections.
 - l. The UV System controller shall provide trends showing UV Train Flow, UV Transmittance, and UV Dose over time as a minimum.
- 3. The UV System control panel shall communicate all signals with the plant SCADA.

F. Inputs / Outputs:

- 1. The following signals will be available from the plant SCADA to the CPP via the plant network as a minimum:
 - a. SCADA Heartbeat (e.g. rolling counter).
 - b. SCADA UV to Storage Valve Statuses (Remote, Opened, Closed).
 - c. SCADA UV to Waste Valve Statuses (Remote, Opened, Closed).
 - d. SCADA Intermediate Pump Statuses (Remote, On/Running).
 - e. System Required Flow.
 - f. System Required UV Dose.
 - g. System Run Request.
 - h. System Shutdown Request.
 - i. Enable Permissive for UV train.
- 2. The following signals are to be sent from the CPP to the plant SCADA via the plant network as a minimum:
 - a. System Heartbeat (e.g. rolling counter).
 - b. System Remote.
 - c. System Ready.
 - d. System Common Alarm.
 - e. System Sequence Mode Status.
 - f. All general alarms for UV train.

- h. All critical alarms for UV train.
 - i. Ballast ON/OFF for UV train.
 - j. Ballast Power Level for UV train.
 - k. Lamp ON/OFF status for UV train.
 - l. Remote (e.g., control is from plant SCADA) for UV train.
 - m. Running Status (on/running, warming, shutdown, ready, offline) for UV train.
 - n. Effluent Valve: Status (Remote, Opened, Closed, Position Feedback) for UV train.
 - o. Influent Valve: Status (Remote, Opened, Closed) for UV train.
 - p. Flow (MGD) for UV train.
 - q. Cumulative Volume (MG) for UV train.
 - r. Cumulative Off-Spec Volume (MG) for UV train.
 - s. Intensity (per lamp) for UV train.
 - t. Reduction Equivalent Dose (MS2 and T1) for UV train.
 - u. Validated Dose (mJ/cm²) for UV train.
 - v. Validation Factor for UV train.
 - w. ASCF for UV train.
 - x. Log Inactivation of Giardia.
 - y. Log Inactivation of Cryptosporidium.
 - z. Log Inactivation Virus.
 - aa. Lamp Run Time (Hours) for UV train.
 - bb. UV Dose Operating Safety Factor (1.XX) for UV train.
3. As a minimum, the UV System control panel shall provide the following critical alarms to the plant SCADA for the UV train and will automatically shut-down the UV reactor:
- a. GFI Fault.
 - b. Lamp failure.
 - c. Ballast failure.
 - d. Low water level.
 - e. Cabinet high temperature.
 - f. High reactor/lamp temperature.
 - g. Ballast high temperature.
 - h. E-Stop Alarm/ CPP emergency stop.
 - i. Measured flow above validated range (Off-specification event).
4. All alarms generated by the UV Local CPP shall be logged and displayed on the UV Remote control panel, and the UV System control panel HMIs. Each alarm shall be time and date stamped when it occurs.

G. Field Instruments:

- 1. Portable UVT Analyzer:
 - a. Provide one (1) portable or handheld, NIST traceable UVT analyzing device to verify performance in field, as recommended by the 2006 UVDGM.
 - b. Manufacturer:
 - 1) RealTech or approved equal.

2.9 ACCESSORIES

- A. Equipment Identification Plate: 16 gauge stainless steel with 6 mm die-stamped equipment tag number securely mounted in a readily visible location.
- B. Lifting Lugs: Equipment weighing over 100 pounds.
- C. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The UV Supplier shall furnish instructions and supervise the work of the Installing Contractor regarding installation of the UV System. The Installing Contractor shall install the UV System in strict accordance with UV Supplier's instructions.
- B. The UV Supplier shall provide direct supervision of the work of the Installing Contractor of the installation of the UV System if requested by the Owner, including but not limited to:
 - 1. Direct supervision of installation of the UV Reactor, Control Power Panel, and interconnecting control/power wiring.
 - 2. Direct supervision of the work of the Installing Contractor of the installation of UV System HMI computers (panel-mounted computers are not to be shipped with the panel).
 - 3. Verify all field wiring I/O connections made by the Installing Contractor.
 - 4. Inspect, test and verify all communications links from the respective CPPs to the Main Plant PLC. Inspect, test and verify all LAN communications connections between the CPP and the communication switches.
 - 5. Installing Contractor shall provide and install anchor bolts, fasteners, washers, and templates needed for installation of UV Equipment. The UV Supplier shall design and locate anchor bolts and submit this information as part of the UV equipment shop drawings, calculations and installation instructions submissions.
 - 6. Provide assistance to Owner for programming modifications required to integrate into the water plant's existing SCADA system.
- C. A 2-inch gap shall be provided between the rear of the control panels and the wall for all new, freestanding and wall mounted enclosures.
- D. The UV Supplier shall complete the Manufacturer's Certificate of Proper Installation upon satisfactory installation of the UV System.
- E. Refer to General Conditions specifications for additional requirements.

3.2 TESTING - GENERAL

- A. The UV Supplier is required to complete the following tests:
 - 1. Factory Acceptance Testing.
 - 2. Functional Testing.
 - 3. Performance Testing.
- B. Refer to General Conditions specifications for general requirements regarding these tests. Additional test requirements are defined below.
- C. The UV Supplier shall calibrate all instruments, sensors, and meters supplied for testing, including the analyzers, UV intensity sensors, and power consumption meters.

3.3 FACTORY ACCEPTANCE TEST

- A. The UV Supplier shall be responsible for the Factory Acceptance Testing (FAT) that shall be conducted by the UV Supplier after the shop drawings are approved and before UV System is shipped to the Site.
- B. The UV Supplier shall factory test all major UV System components of the UV System during a single test session for compliance with the construction and functional requirements specified herein.
- C. The UV Supplier shall submit a FAT Plan, for approval by Engineer that will demonstrate the full operability of UV Reactors. The test plan shall include, but is not limited to the testing of the delivery of the lamps, the intensity sensors, the cleaning system, CPP for each of the UV reactors, and the instrumentation and controls for each of the reactors, and operator interface units. The test will verify the functions of the UV System via simulation or other methods. The PLC and HMI hardware and software is to be set up to allow thorough testing of controls and communications. The scope of the FAT shall demonstrate that each individual component of the UV System operates as specified.
- D. For the FAT, the UV Supplier is to assemble all CPPs to demonstrate the complete UV System. Provide all necessary communications links between the respective panels and computers to simulate the complete UV System. The UV Supplier shall provide 3 weeks' advance notice prior to conducting the FAT. The Owner and/or Engineer may elect to witness the FAT. Costs to witness the FAT shall be the responsibility of the Owner.
- E. The UV Supplier shall submit a FAT Report discussing the tests performed, items witnessed, and the results for the approval of the Engineer within 14 days following conclusion of the Factory Test.

- F. The UV System components shall not be shipped until the final FAT Report is approved.

3.4 FUNCTIONAL TEST

- A. The UV Supplier shall submit a Functional Test Plan, for approval by Engineer that will demonstrate the full operability of UV System. The test plan shall include, but is not limited to the testing the full functionality of the UV System. The test will verify the functions of the UV System as installed. The scope of the Functional Test shall demonstrate that each individual component of the UV System operates as specified and that the UV System operates with the complete treatment plant as specified.
- B. Contractor with Owner for Owner's SCADA representatives to be present for testing, and to make any adjustments to SCADA programming as specified in 3.1 above.
- C. Contractor, with assistance from the UV Supplier shall complete all functional testing to the satisfaction of the Engineer and the Owner prior to commencing the Facility Startup. The purpose of the Functional Test shall be to demonstrate the effectiveness of all UV System components and control features in all modes of control. Testing shall include:
 - 1. Automatic "start/stop" of UV reactor by SCADA.
 - 2. Manual "start/stop" of UV reactor by local UV System Controller.
 - 3. Automatic shutoff and alarms for various failure modes for UV reactor, including but not limited to loss of UVT or flowrate signals, lamp or ballast failure, low **water** level in reactor, high temperature, cleaning system failure etc., as listed in section 2.07.F.
 - 4. Monitoring and trending of operating data.
 - 5. Monitoring and control from remote workstation.
 - 6. Bumpless switchover from normal power to emergency power, and emergency power to normal power.
 - 7. Operation of UV reactor cleaning systems
 - 8. Operation of all monitoring instruments.
 - 9. All control functions, both at the CPP and remote HMI.
 - 10. Modifying lamp output to verify that UV intensity sensors can detect changes in UV intensity.
 - 11. Modifying flow and UVT to verify UV System can modify and maintain adequate UV dose.
 - 12. All specified communications between the CPP and SCADA.

3.5 PERFORMANCE TEST

- A. The UV Supplier shall submit a Performance Test Plan for approval by the Owner and Engineer that will demonstrate the full operability of UV System. The test plan shall include, but is not limited to demonstrating automatic, manual, and

local modes of operation of the UV System and continuous operation without the production of off-specification water due to failure of any UV System component.

- B. Performance Test shall not commence until after successful completion of Functional Test, approval by Owner/Engineer of Performance Test Plan, and minimum of 100 hours of operating time of entire UV System (e.g. lamps, ballasts) at 100 percent power level. UV Supplier shall be responsible for replacing failed components of the UV System during this burn-in period at no additional cost to the Owner.
- C. Successful completion of the Performance Test shall be defined as 15 calendar days of continuous operation per UV reactor without the production of off-specification water due to failure of any UV System component and demonstration that UV System meets all performance requirements established herein. Downtime resulting from Plant's operation, including flow or UVT outside of UV reactor's validated range, will not be counted against the criteria of "continuous days of operation."
- D. The Performance Test shall include normal starts, stops, and changeover to backup UV reactor. Performance Test shall verify normal and emergency (i.e., reactor failure or loss of UVT signal) operation of each installed UV reactor without malfunction.
- E. The Performance Test shall include headloss check, power consumption check, UVT and intensity sensor calibration checks, power consumption at guaranteed set points, power factor measurements, harmonics measurements, lamp output verification, sleeve output verification, and UV System dose check (based on UV System CPP readings and calculations). Specifically include:
 - 1. UV Supplier's portable UVT analyzer, and prepare documentation on its compliance with the 2006 UVDGM requirements.
 - 2. Sensor calibration checks of all supplied/installed duty and reference sensors weekly. Provide uncertainty calculations based on field evaluations. Compare sensor uncertainty based on field evaluations with that provided in the third-party validation. Prepare documentation on the duty UV sensors' compliance with the 2006 UVDGM requirements.
 - 3. Measure 'S/So' at the beginning of the Performance Test after 100-hr minimum burn-in period. Measure 'S/So' for each lamp in each reactor at the end of the Performance Test. Calculate S/So for each lamp/sensor. Identify any results that are outside of manufacturer expectations.
- F. The UV Supplier shall be responsible for coordination and inclusion in the report of all data and results required to meet the reporting requirements whether raw data is contained in UV Supplier's PLC or Plant PLCs or SCADA. As a minimum, results shall be provided as follows:
 - 1. Daily tabulated data (provide range and average if applicable) of recorded information.

2. Energy:
 - a. Average and range of energy consumption per day (data provided by Owner).
 - b. Average energy consumption per volume of net water treated.
 - c. Harmonic testing results showing UV System performance measured at 50 percent, 75 percent and 100 percent of ballast rated load with harmonics (Voltage and Current) measured to the 35th harmonic. Results shall show that the harmonics are below IEEE 519 standards with a Point of Common Coupling (PCC) at the input terminals of the UV CPP on utility and emergency generator power.
 - d. Power factor of CPP throughout the full operating range.
3. Headloss: Headloss across each reactor at minimum, average, and maximum flow (if available).
4. Other:
 - a. Quantity of sleeve cleaning cycles and estimated quantity of cleaning materials consumed (if applicable).
 - b. Complete list of parts replaced and reasons for replacement.
 - c. Complete list and results of calibration or other maintenance activities performed and reasons.
 - d. Summary of off-specification occurrences.
 - e. Results from off-site lamp output, sleeve transmittance, and UV intensity sensor verifications.

3.6 TRAINING OF OWNER'S PERSONNEL

- A. General:
 1. Provide for training of designated Owner's personnel in the operation and maintenance of the UV System including all components provided under this Contract.
 2. Training shall consist of both classroom and hands-on sessions conducted at time and location acceptable to the Owner.
 3. Designate a person responsible for scheduling and coordinating all training.
 4. Training sessions may be videotaped if the Owner so chooses. If sessions are to be videotaped, Supplier shall be responsible for providing all necessary videotaping equipment.
- B. UV Manufacturer's personnel shall provide detailed system training including, as a minimum, the following:
 1. System operations philosophy.
 2. System Control:
 - a. Loop Functions: The understanding of loop functions including interlocks.

- b. Loop Operation: For example, adjusting process variable set points, and control, annunciator acknowledgment and resetting, etc.
 - c. Interfaces with other loops and subsystems.
 - 3. Operator interface/system set points.
 - 4. Component performance requirements.
 - 5. Component functions.
 - 6. Component maintenance.
 - 7. Component troubleshooting.
 - 8. Instrument operation, maintenance, troubleshooting, replacement, and calibration procedures.
- C. Classroom training shall be conducted during regular working hours on weekdays at a location to be designated by the Owner. Hands-on training may be conducted during and as a part of startup. Training shall be repeated in equal morning and afternoon sessions to accommodate Owner's employee's schedules. Provide 10 paper copies of all overheads and slides and one electronic copy used for training.
- D. Manufacturer's representative shall be familiar with plant O&M requirements as well as with the specified equipment.
- E. Coordinate training periods with Owner's operating personnel and manufacturer's representatives, and with submittal of O&M Manuals.
 - 1. Initial training shall be completed at least 14 days prior to actual startup, but not more than 45 days prior to startup.
 - 2. O&M Manuals shall be reviewed, accepted, and resubmitted in accordance with this section before start of training. Any modifications resulting from startup of the facility shall be incorporated into the final manuals.

3.7 UV SUPPLIERS' SERVICES

- A. Provide qualified UV Supplier's Representative at site for installation assistance, inspection and certification of proper installation, functional testing assistance, performance testing assistance, and training of Owner's personnel for specified component, subsystem, equipment, or system.
- B. UV Supplier's Representative: Present at project site or classroom designated by the Owner for minimum person-days listed below, travel time excluded:
 - 1. 1-person-day and 1-trip for inspection of mechanical, electrical, and control system installations prior to testing and startup.
 - 2. 5-person-days in 1 trip for Functional Testing.
 - 3. 5-person-days in 1 trip for Performance Testing.
 - 4. 4-person-days in 2 trips for pre- and post-startup training of UV System for Owner's personnel.

- C. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by the Owner.

3.8 EQUIPMENT GUARANTEE

- A. Guarantee each item of mechanical and electrical equipment, instruments and device furnished under this Contract against defects including, but not limited to, the following:
 - 1. Defective material or workmanship of both.
 - 2. Leakage, breakage or other failure which might occur under normal and proper operation of the equipment under the specified conditions.
 - 3. UV Reactor/Component Failure, as defined herein, during the Guaranteed Life.
- B. Provide a guarantee for a period of two (2) years from acceptance of the Performance Test based on an approved Test Report and Substantial Completion.
- C. Replace each item of equipment or part thereof proving to be defective.
- D. Bear the entire expense of replacement including, but not limited to, the cost of all necessary labor, supervision, traveling, replacement parts, transportation and shipping cost. Supplier to coordinate and facilitate all work.
- E. The UV Supplier shall warrant the Lamps, Quartz Sleeves, Ballasts, and Duty and Reference UV Intensity Sensors for the Guaranteed Life following final acceptance after Substantial Completion. If the UV Supplier is not the item's Manufacturer, the Warranty shall be provided, in writing, directly to the Owner by the item's Manufacturer.
- F. UV Lamps:
 - 1. MP UV lamps shall be warranted for at least 5,000 hours and prorated after 1,000 hours. If a lamp fails within the initial prorated period, the UV Supplier shall provide a replacement lamp to the Owner free of charge. If a lamp fails after the initial prorated period (e.g. 1,000 hours) and before the guaranteed life (e.g. 5,000 hours), the following formula will be used to determine the discounted price for replacement lamps:

$$\text{Lamp Price} = ((\text{Lamp Operating Hours} - \text{Initial Proration}) / [\text{Guaranteed Life} - \text{Initial Proration}] \times \text{Guaranteed Price})$$
- G. Ballasts:
 - 1. The ballasts shall be warranted for at least 10 years and prorated after 2 years. If a ballast fails within the initial prorated period, the UV Supplier shall provide a replacement ballast to the Owner free of charge. If a ballast fails after the initial prorated period (e.g. 2 year) and before the guaranteed

life (e.g., 10 years), the following formula will be used to determine the discounted price for replacement ballast:

$$\text{Ballast Price} = ((\text{Ballast Age} - \text{Initial Proration}) / [\text{Guaranteed Life} - \text{Initial Proration}] \times \text{Guaranteed Price})$$

H. Quartz Sleeves:

1. The quartz sleeves shall be warranted for at least 10 years and prorated after 1 year. If a quartz sleeve fails within the initial prorated period, the UV Supplier shall provide a replacement quartz sleeve to the owner free of charge. If a quartz sleeve fails after the initial prorated period (e.g. 1 year) and before the guaranteed life (e.g. 10 years), the following formula will be used to determine the discounted price for replacement quartz sleeve:

$$\text{Quartz Sleeve Price} = ((\text{Quartz Sleeve Age} - \text{Initial Proration}) / [\text{Guaranteed Life} - \text{Initial Proration}] \times \text{Guaranteed Price})$$

I. UV Sensors:

1. The duty and reference UV sensors shall be warranted for a minimum of 5 years and prorated after 1 year. If a sensor fails within the initial proration period, the UV Supplier shall provide a replacement sensor to the Owner free of charge. If a sensor fails after the prorated period (e.g., 1 year) and before the guaranteed life (e.g., 5 years), the following formula will be used to determine the discounted price for replacing a sensor:

$$\text{Sensor Price} = ((\text{Sensor Age} - \text{Initial Proration}) / [\text{Guaranteed Life} - \text{Initial Proration}] \times \text{Guaranteed Price})$$

3.9. UV SYSTEM SERVICE AND MAINTENANCE CONTRACT

- A. On the Date of acceptance after performance testing the Ultraviolet System Supplier shall provide a one year, renewable at the option of the Owner, service and maintenance contract. The contract price shall be renewable for up to an additional four (4) years at the option of the Owner. The service and maintenance contract scope shall be outlined in a proposal submitted by the Ultraviolet System Supplier and shall include, as a minimum, the following items listed herein:
 - a. Annual equipment maintenance check on all instrumentation devices, monitors, local programmable controllers, local instrument loops, and electrical equipment of the ultraviolet disinfection system equipment components furnished.
 - b. Replacements parts, including but not limited to lamps, sleeves and ballasts, will be provided by the Ultraviolet System Supplier on an as-needed basis. The Owner will inform the Ultraviolet System Supplier when minor alarms of the UV Disinfection System occur in order to have the replacement parts on site in a timely manner. The Owner will also

maintain spare parts for one reactor which shall be replenished by the Ultraviolet System Supplier when used.

- c. Twenty-four hour per day availability to provide verbal direction and response to troubleshooting inquiries regarding equipment furnished.
- d. Annual tuning of the ultraviolet disinfection system to optimize system performance and inspection of each reactor to determine the need for cleaning. If cleaning is required, the Ultraviolet System Supplier shall supervise the cleaning operations performed by Owner's personnel.
- e. Annual training of Owner's staff, particularly management, operating, and maintenance personnel, covering the operation and maintenance of the complete UV System.

****END OF SECTION** -**

SECTION 137100

ULTRAVIOLET LED TREATMENT SYSTEM

PART 1 – GENERAL

1.1 GENERAL

- A. Overview:
 - 1. The ultraviolet (UV) LED treatment system and work specified herein is to be considered an add alternative bid item, and will only be furnished and installed if accepted and authorized by the Owner as part of the Contractor's bid package submission.
 - a. If the UV LED treatment system is accepted and authorized by the Owner, then the medium-pressure UV system as shown and specified (Section 137000) will not be furnished and installed.
 - 2. This section covers the general requirements for the design, fabrication, installation, and testing of one (1) new ultraviolet (UV) LED disinfection system.
 - 3. As part of this work, the Contractor shall also remove the two (2) existing medium-pressure UV disinfection systems from service, including the associated control panels and the UPS.
 - 4. Some related equipment and infrastructure shall remain in place and available to be utilized for the new UV LED disinfection system. Refer to Contract Documents for additional information and details.
- B. The new UV system shall include the following principal components:
 - 1. Three (3) UV LED reactor units
 - 2. One (1) pressure vessel assembly with an internal quartz sleeve and flanged end connections
 - 3. UV Intensity Sensor
 - 4. Integrated system controls for each reactor unit
 - 5. A remote HMI panel to monitor and control each reactor unit
 - 6. Accessories and special tools
 - 7. Spare parts.
- C. The UV LED system shall be capable of providing additional disinfection of the filter effluent to meet the water quality standards specified in this section.
- D. The manufacturer shall supply all accessories and appurtenances required for satisfactory operation of the integrated UV LED disinfection system.
- E. The UV LED System shall be furnished by a single qualified Ultraviolet System Supplier who shall provide all services, equipment, and appurtenances required for a complete, fully integrated and operational system that meets all the design

conditions, testing requirements, performance guarantees, and warranties specified herein.

1.2 DEFINITIONS

- A. UV Dose – The total radiant energy incident from all directions onto an infinitesimally small sphere of area dA , divided by dA , for a given contact time in seconds. The unit of UV dose shall be millijoules per square centimeter (mJ/cm^2) and shall be calculated as follows:

$$D = I \cdot t$$

Where: D = UV Dose, $mW \cdot s/cm^2$ (mJ/cm^2)
 I = average intensity or irradiance, mW/cm^2
 t = average exposure time, s

- B. UV Transmittance (UVT) – The transmittance of ultraviolet light at a wavelength of 280 nm through the water across a pathlength of 1 cm. UV transmittance shall be calculated from UV absorbance (A) at 280 nm by the following equation:

$$\text{Percent transmittance} = 100 \times 10^{-A}$$

- C. Intensity or Irradiance – The total radiant power incident from all directions onto a infinitesimally small sphere of cross-sectional area dA , divided by dA . The units of intensity shall be milliwatts per square centimeter (mW/cm^2).
- D. Validated Reactor – A reactor that has been validated under the below conditions. The validation protocol shall be submitted to the Owner and Engineer for review and approval. The Owner shall have final approval of the validation procedure.
1. The validated flow range contains the design flow range per reactor as required.
 2. The validated UVT range contains the operational UV transmittance range as required.
 3. The validated dose range contains the operational germicidal UV dose range as required.
- E. Equivalent Dose – The maximum dose necessary for a full-scale UV system to achieve a level of inactivation of a specific organism equivalent to the level of inactivation for the same organism achieved in a laboratory using a collimated beam apparatus with a low pressure or UV LED lamp producing UV energy at a wavelength of 250-280 nm range to test a water sample collected at the same time.
- F. UV-C LED - Solid-state device emitting germicidal UV energy at a supplier-specified peak.

- G. UV-C LED Lamp Array – MCPCB mounted UV LED devices integrated into a UV-C LED lamp module.
- H. LED Driver – Constant-current electronic power supply connected to UV-C LED lamp arrays.
- I. UV-C LED Lamp Module – An assembly that incorporates one UV-C LED arrays, associated thermal management components, and electrical interfaces for connection to one or more constant-current LED drivers.
- J. Guaranteed Life – The manufacturer’s warranted life of the lamp module, sleeve,, and sensor as submitted by Ultraviolet System Supplier and acceptable to Owner and Engineer.
- K. Expected Lamp Life – The manufacturer’s estimated life of the lamp based on the operating conditions.
- L. Prorated Start Time – The time beginning after a minimum of 20 percent of the guaranteed life has lapsed.
- M. Guaranteed Maximum Total System Energy Use – A calculated present worth value based on Ultraviolet System Supplier data reflecting energy use in kilowatt-hours per year.
- N. Guaranteed Maximum Head Loss – The head loss in inches of water column allowed through the UV reactor between the inlet flange and the outlet flange at peak production rate.
- O. Definitions of Ultraviolet (UV) Reactor/Component Failure:
 - 1. UV Lamps shall be deemed to have failed when:
 - a. UV Lamp fails to light when powered.
 - b. UV Lamp fails to achieve performance requirements for disinfection specified herein.
 - c. UV Intensity falls below UV Supplier’s guaranteed end of life output (with UV Transmittance (UVT) > design value; sleeves cleaned by the UV Reactor’s automatic cleaning system).
 - 2. Pressure vessel assembly (PVA) shall be deemed to have failed when:
 - a. PVA breaks or leaks water while operating within the conditions specified herein.
 - 3. UV Intensity Sensors shall be deemed to have failed when:
 - a. UV Intensity Sensors are not able to be calibrated at the factory.
 - b. Duty Sensors drift out of calibration more than twice per month when checked with the reference intensity sensor per USEPA guidelines. Duty sensors shall be deemed out of calibration if intensity value at 100 percent lamp power differs from reference sensor intensity value by more than 20 percent absolute value.

4. UV Reactor shall be deemed to have failed when: Minimum required Reduction Equivalent Dose (RED) or log inactivation, as specified herein, cannot be achieved under conditions that include flow, UVT, and lamp and sleeve life within design values.

1.3 REFERENCES

- A. The following is a list of the references which may be found in this Section:
 1. American Water Works Association (AWWA): F110-16 Ultraviolet Disinfection Systems for Drinking Water.
 2. American National Standards Institute (ANSI).
 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE): 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
 - U.S. Environmental Protection Agency (USEPA): Final UV Disinfection Guidance Manual (UVDGM) - 2006 UVDGM.
 5. EPA UV Toolkit (2022) and EPA Innovative Approaches for UV Validation (2020).
 6. Water Research Foundation (WRF): Guidance Document for Testing Medium Pressure UV Inactivation of Viruses. Project Number 4376 (latest version).
 7. National Fire Protection Association (NFPA): 70, National Electric Code (NEC).
 8. National Science Foundation (NSF) / ANSI:
 - a. Standard 60: Drinking Water Treatment Chemicals–Health Effects.
 - b. Standard 61: Drinking Water System Components–Health Effects.
 - c. NSF/ANSI 372, Drinking Water System Components - Lead Content.
 9. Underwriters Laboratory, Inc. (UL):
 - a. 50, Enclosures for Electrical Equipment, Non-Environmental Considerations.
 - b. 50E, Enclosures for Electrical Equipment, Environmental Considerations.
 - c. 508, Industrial Control Equipment.
 - d. 508A, Industrial Control Panels.

1.4 SUBMITTALS

- A. Shop Drawing:
 1. List mechanical components of UV LED System and provide complete catalogue information, descriptive literature, specifications, and identification of materials of construction, including spare parts.
 2. Detailed UV LED reactor information including make/model, flange size,

headloss curve, min/max validated and allowable flow rate, min/max validated and allowable UVT, min/max RED, min/max log inactivation, reactor support requirements, quantity/location of UV LED lamps and intensity sensors, cooling water requirements, , and air-release/drain line connection details.

3. Provide summary calculations to show compliance with the minimum required UV dose MS2 RED basis at the worst-case design conditions that were utilized as the basis for the capital sizing of the UV System. Include the estimated action spectra correction factor (ASCF) based on latest published validation test results and UV reactor CFD modeling or lookup tables following WRF Guidance.
4. Provide maximum flowrate capacity for an individual UV reactor to achieve 2-log virus inactivation at 90, 92.5, 95, and 97.5 percent UVT, including estimated ASCF based on WRF Guidance.
5. Drawings showing plan layout, cross-sections, dimensions, critical clearances, installation requirements, and all interconnections and interface requirements (power, controls, instrumentations, etc.). Identify separately-mounted components, connections to other work, critical clearance requirements, interconnections and interface requirements, and the validated hydraulic configuration.
6. Provide all UV LED Equipment weights (dry and wet) and equipment anchoring criteria for design of structural support by Engineer.
7. Summary of UV LED System control strategy including UV dose equation or calculations as a function of flow, UVT, Validation Factor, target organism inactivation, lamp age/sleeve fouling factors, and action spectra correction factor. Provide graph or table of min/max RED as a function of flow, UVT, S/So, and LED driver output (% power).
8. Detailed description of instrumentation and control system, including a list of all functions monitored, controlled, and alarmed.
9. Input power voltage, frequency, and phase requirements, total system maximum power load, power quality thresholds, and LED driver turndown capabilities. Include estimated heat load generated by each power/control panel at maximum power draw.
10. Specifications for all interconnecting cables between the UV equipment, including voltage ratings, insulation type, conductor material and cable/conductor outside diameter, maximum cable length, and cable terminator type and quantity.
11. A list of all replaceable system components along with their expected replacement frequencies, duration of life warranties, guaranteed replacement prices, and calibration frequencies. Include a list of special tools required for checking, testing, parts replacement, and maintenance.
12. Lamp data including watt rating, initial lumen output, lamp aging factors, and average lumens.
13. Complete description of the automatic lamp sleeve cleaning process and its maintenance requirements.
14. Validation Testing: Full, detailed report with third party signature, raw data, and documentation of all reactor performance validation testing per

the 2006 Final UVDGM. Include completed versions of Checklists 5.1 through 5.5 of the 2006 Final UVDGM. Checklists shall be signed and dated by the UV LED Supplier. Provide summary of deviations from the 2006 Final UVDGM. Report shall be available for review by Owner, Engineer, and other officials deemed necessary.

15. Third-party certification of lamp aging factor and fouling factor.
16. Details of duty and reference UV intensity sensors including sensor traceability and uncertainty from linearity, temperature response, spectral response, angular response, and long-term drift. Include calibration requirements necessary for compliance with UVDGM requirements.
17. Process and instrumentation diagrams and description of all functions monitored, controlled, and alarmed.
18. Control system block diagram(s) including the Human Machine Interface (HMI(s)), Programmable Logic Controller (PLC(s)), and control networks. Proposed layouts and development of all HMI screens for control of the UV LED disinfection system.
19. Preliminary PLC ladder logic listings, input/output (I/O) printouts, and cross-referenced printouts documenting programmable controller software program.
20. Provide native format electronic copies of the software installed in UV LED Supplier's PLC and HMIs, annotated to carefully detail all program instruction functions and purposes. Minimum control, monitoring and alarm signals/information are detailed in the Functional Requirements paragraph in this Section.
21. Details of control and power panels including internal and external panel layouts, dimensions, access requirements, materials of construction, bill of materials, electrical schematics, and wiring diagrams. Include software and hardware component details.
22. Equipment delivery, storage, and installation requirements.
23. Preliminary Operation and Maintenance Manual.
24. Preliminary Operator Training Materials.

B. Quality Control Submittals:

1. Factory Acceptance Test Plan.
2. Final Factory Acceptance Test data sheets and witness report.
3. UV LED Supplier's Certificate of Proper Delivery for all UV Supplier supplied equipment.
4. UV LED Supplier's Certificate of Proper Installation for all UV Supplier supplied equipment.
5. Functional Test Plan: Provide a narrative of the test plan and data to be recorded and analysis to be completed, including all forms for recording data during the test.
6. Functional Testing Report: Provide a narrative and data summary of the Functional Testing discussing each element requiring testing, the tests performed, and the results. Functional Testing is not complete until this report is submitted and accepted by the Engineer.

7. Performance Test Plan: Provide a narrative of the test plan and data to be recorded and analysis to be completed, including all forms for recording data during the test.
 8. Performance Testing Report: Provide a narrative and data summary of the Performance Testing discussing each element requiring testing, the tests performed, and the results. Performance Testing is not complete until this report is submitted and approved by the Engineer.
- C. Contract Closeout Submittals:
1. Final Operation and Maintenance Manuals as specified in the General Requirements.
 2. Final Operator Training Materials.
 3. List of all original equipment by model and part number (detailed bill of materials). List manufacturer names, addresses, and phone numbers.
 4. Provide Final PLC and Operator Interface programs on a flash drive in Rockwell Automation native format.
 - a. Fully documented ladder logic listings, function listing for function blocks not fully documented by ladder logic listings, cross-reference listings and operator interface configuration documentation.
 5. Service records for maintenance or calibration reports for calibration performed during construction or testing activities.

1.5 SPARE PARTS & MATERIALS

- A. Provide the following spare parts:
1. UV LED Module: One complete UV LED lamp module.
 2. UV Intensity Sensor: One (1) UV Intensity Sensor.
 3. Complete set of cleaning products for user level maintenance.
 4. Complete set of special tools for user level maintenance.
 5. Three (3) complete sets of fasteners, O-rings seals and gaskets for lamp modules.
 6. Spare parts for programmable controllers:
 - a. One of PLC processor used.
 - b. One of each type of I/O module used.
 - c. One of each type of mounting chassis used.
 - d. One of each type of communications module used.

1.6 SHIPPING, HANDLING, & STORAGE

- A. As much as practicable, equipment shall be factory assembled. The equipment parts and assemblies that are, of necessity, shipped unassembled shall be furnished with an assembly plan and instructions. The separate parts and assemblies shall be match-marked or tagged in a manner to facilitate field assembly of the equipment.

- B. Generally, machined and unpainted parts subject to damage by the elements shall be protected with an application of a strippable protective coating.
- C. Equipment shall be packaged or crated in a manner that will protect equipment from damage during shipping handling, and storage.
- D. The outside of the package or crate shall be adequately marked or tagged to indicate its contents by equipment name, Contract number, and equipment number if applicable; approximate weight; state any special precautions for handling; and indicate the recommended requirements for storage prior to installation.
- E. Spare parts and special tools shall be properly marked to identify the associated equipment by name, equipment, and part number. Parts shall be packaged in a manner for protection against damage from the elements during shipping, handling, and storage. Spare parts and special tools shall be shipped in appropriately sized, hinged-cover, wood or metal boxes. The boxes shall be marked to indicate the contents and use. Delivery of special tools shall be made prior to the time the associated equipment is scheduled for the initial test run.
- F. Unloading equipment at the jobsite shall be by Installing Contractor, and shall be responsible for ensuring equipment and materials to assist with the unloading are available at the time of delivery. Contractor shall indicate the estimated delivery on the Construction Schedule and subsequent updates. Contractor shall provide Owner and Engineer with at least a 48-hour notice prior to the expected delivery time to the site. Contractor shall coordinate with Owner, Engineer, and plant staff for the delivery, which shall be during regular daytime working hours at the treatment facility, and ensure the delivery does not interfere or impact other deliveries either for the Contractor or, more importantly, plant operations.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Products that will be in contact with potable water shall have NSF 61 certification. Chemicals used by the UV Supplier and for user-level maintenance shall have NSF 60 certification.
- B. The complete electrical assembly shall meet all requirements of the National Electrical Code (NEC), the National Electrical Manufacturers Association (NEMA), the National Fire Protection Association (NFPA), and all applicable local electrical codes.

- C. Components, including equipment, coatings and other parts of the UV LED System, shall comply with American Water Works Association (AWWA) standards, unless specified otherwise.
- D. All terminal point connections shall be ANSI standard flanges.

2.2 DESIGN CRITERIA

- A. The existing water treatment system at the Taylor Mill Treatment Plant located at 608 Grand Avenue in Taylor Mill, Kentucky. The TMTP is a surface water treatment facility with conventional coagulation, sedimentation, and filtration. The raw water is pumped from the Licking River, which is a tributary of the Ohio River.
- B. The new UV LED System will be located downstream of the dual media filtration system. Filter effluent water (<0.3 NTU) would flow through the UV reactor. Any chemical addition for finished water is downstream of the UV reactor.
- C. The new UV LED System will be installed in the Main Filter Building downstream of conventional sedimentation/filtration. Refer to Plans for additional information and details.
 - 1. There are two existing (MP) UV systems and both shall be removed as part of this work. All existing equipment is currently located in the basement of the Main Filter Building.
 - 2. The existing (MP) UV systems are connected to a UPS, which is located in the underground walkway between the Main Filter Building and the Chemical Building. The UPS shall also be removed from service.
 - 3. Only one new UV LED system shall be installed to replace one of the existing UV systems.
 - 4. The monitor and controls for each UV LED reactor unit (3 total) shall be connected to a common HMI panel located with the UV LED system. The HMI panel shall be integrated with the plant SCADA system on the second floor of the Main Treatment Building.
 - 5. Remove existing power and signal conduit and wiring, and install new power and signal conduit and wiring.
 - a. Contractor shall be responsible for furnishing and installing new conduit and wiring between new equipment and components to the new remote HMI panel as well as wiring up to Main Plant SCADA panels, and making final connections to Main Plant SCADA panels. Contractor shall be responsible for the programming to the HMI panel and new UV LED system equipment.
 - b. Owner will be responsible for required modifications to Main Plant SCADA, including programming.
 - 6. Likewise, existing piping, valves, and appurtenances shall be reused to the greatest extent possible although some new piping and appurtenances will need to be furnished and installed to complete the work.

7. The temperature in the basement is expected to be maintained between 50 and 80 deg F.
 8. The existing UPS system and panels, including batteries, conduit and wiring, are to be removed from service when all of the existing UV systems are no longer in service. The new UV system will not require a UPS system as it will be interconnected with the water plant's emergency generator systems.
 - a. Contractor shall confirm with Owner the status of the emergency generator systems project or other work that may or may not have an impact on the UV system work.
 9. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.
- D. Provide UV LED System meeting the following design basis:
1. Total Number of UV Reactors: 1 active reactor
 2. Current UV System Flow: Minimum: 3 mgd
Average: 6 mgd
Maximum: 12 mgd
 3. Reactor Flange Size: 24-inch
 4. Water Temperature Range: 36 to 85 deg F
 5. Turbidity (NTU): Maximum: < 0.3
 6. Design UV RED: As required to meet pathogen performance
 7. UV Transmittance @ 280 nm: Minimum: 90 percent
Average: 95 percent
Maximum: 99 percent
 8. Pathogen Performance: 3.0 log Inactivation (min) Cryptosporidium
3.0 log Inactivation (min) Giardia
- E. Under the USEPA 2006 Final UVDGM, UV reactor shall be validated to provide minimum pathogen inactivation requirement over the full range of flows, UV dose, and water characteristics at the end of lamp life and under fouled quartz sleeve conditions. Validated operating conditions for each UV reactor shall include UVT less than or equal to 85 percent, flowrate greater than or equal to 14 mgd, and log inactivation of Cryptosporidium and Giardia greater than or equal to 3.0.
- F. Validation Testing shall be compliant with the 2006 Final UVDGM. Checklists 5.1 through 5.5 of the 2006 Final UVDGM shall be submitted to show level of compliance with the 2006 Final UVDGM.
- G. The UV System shall be programmed, consistent with the 2006 Final UVDGM, such that UVT greater than the maximum validated UVT shall be considered equal to the maximum validated UVT and flowrates less than the minimum validated flowrate shall be considered equal to the minimum validated flowrate in the UV System programming and dose calculations. No extrapolation of system performance shall be allowed.

- H. UV LED Design Dose for UV LED System Sizing:
1. System shall produce a Validated Dose (Dval) equal to or greater than 40 mJ/cm². The calculated Reduction Equivalent Dose (RED) at the design conditions must be greater than the product of the required dose (e.g., 40 mJ/cm² for 3.0-log *Cryptosporidium*) and the validation factor (VF) calculated per the 2006 Final UVDGM for *Cryptosporidium* based on MS-2 bacteriophage.
 2. UV LED system shall be sized to meet the minimum disinfection requirements for all design conditions below:
 - a. Flowrate of 12 mgd or greater at 90 percent UVT, including ASCF based on WRF Guidance.
 - b. Flowrate of 12 mgd or greater at 95 percent UVT, including ASCF based on WRF Guidance.
 - c. Flowrate of 12 mgd or greater at 97 percent UVT, including ASCF based on WRF Guidance.
 3. The product of the end of lamp life aging factor (ELAF) and the quartz sleeve fouling/aging factor (QSFF) shall be incorporated into the UV LED design dose.
 4. The ELAF provided by the UV LED Supplier shall be based on the 3rd party verified lamp output as a fraction of specified new lamp output after 100 hours of operation. The maximum ELAF allowed is 0.95.
 - a. If no 3rd party certification is submitted the ELAF shall be no higher than 0.90.
 5. If an alternate end of lamp aging factor is used, third-party certification (signed by a registered professional engineer) of the factor and the conditions under which it was determined shall be provided.
 6. The QSFF shall be no greater than 0.90 for UV Systems with automatic cleaning mechanism. Third-party certification (signed by a registered professional engineer) of the factor and the conditions under which it was determined shall be provided.
 7. The ASCF for any surrogate organism used in validation of a medium pressure lamp reactor shall be based on WRF Guidance for initial UV System sizing. Supporting documentation shall be provided to show ASCF estimation using CFD basis, consistent with WRF Guidance. If estimation of the ASCF based on WRF Guidance is not provided, a default value of 1.50 shall be used for all conditions.
- I. UV LED Reactor Headloss: Maximum of 24 inches measured from inlet to outlet flange at maximum reactor design flow rate.
- J. Input Voltage: 208Y Volts Alternating Current (VAC), 60 Hz, 3-phase, 3-wire. UV System shall be capable of operating during a 30 percent voltage drop from nominal, without shutting down. UV LED System shall be capable of operating during an 8 millisecond voltage drop without shutting down.

- K. All components in contact with the treated water shall be designed to handle pressures of up to 150 psig and shall be fully assembled and hydrotested at 1.5 times the design pressure at the factory prior to shipment.
- L. The UV LED System shall be comprised of the following components:
 - 1. UV LED System including chamber with flanged connections, quartz sleeve, UV-C LED lamp modules, remote HMI panel, and appurtenances.
 - 2. UV-C LED Lamp Modules:
 - a. Three (3) UV-C lamp modules.
 - b. Inlet and outlet connections for water cooling loop.
 - c. UV-C LED lamp arrays.
 - d. Integrated control system interface with Modbus TCP interface.
 - 3. Calibrated UV Intensity sensor(s):
 - a. One (1) duty intensity sensor.
 - b. Reference UV sensor: refer to Section 1.5, Spare Parts & Materials. The UV LED System shall be able to continue providing disinfection while the UV intensity sensor is being calibrated or checked for calibration.
 - 4. Remote UV LED System HMI:
 - a. One (1) required. Integrate the monitor and control capabilities of each UV LED lamp module into the Remote UV LED System HMI.
 - b. Provides an additional operator interface near the UV reactor.
 - c. Located adjacent to UV reactor affixed to an independent support panel as shown on Contract Drawings.

2.3 UV LED SUPPLIER

- A. Materials, equipment and accessories specified in this section shall be products of:
 - 1. AquiSense, Inc.
 - 2. No substitutions allowed.

2.4 UV SUPPLIER SCOPE OF SUPPLY

- A. The UV LED System shall be furnished by the UV LED Supplier, complete with all validated UV LED System, UV LED modules (3), UV intensity sensor, remote HMI panel, and user manual.

2.5 SCOPE OF SUPPLY FOR CONTRACTOR

- A. Owner will be responsible for updating and/or modifying the Main Plant SCADA, including programming in the Main Plant SCADA.
- B. Contractor shall install all signal wiring and conduit to the UV LED modules as well as the Remote UV LED System HMI. Install new CAT 6 ethernet cable

from the new equipment to the Main Plant SCADA. Contractor shall be responsible for labelling and tagging all new conductors as well as programming for the UV LED modules and Remote HMI. Contractor shall size conduit for 150% of the number of conductors required for operations. Contractor shall be responsible for supplying and installing all the necessary materials, equipment and appurtenances not supplied as part of the scope of supply for the UV LED System, but required for a complete, functional and operational UV LED System including, but not limited to:

1. Structural supports required to install the UV LED System, piping, and Remote UV LED System HMI.
2. UV LED System, isolation valves (existing), and associated piping as shown on Contract Drawings.
3. All the hardware, fasteners, anchor bolts, nuts, plates and angles necessary for the installation of the UV LED System. All hardware, fasteners, anchor bolts, nuts, plates, angles, etc., shall be Type 316 stainless steel.
4. All mating flanges, insulating flanges, couplings, gaskets, bolts, nuts, and all necessary piping specialties to install the reactors, and analyzers, supplied by the UV LED Supplier. Mating flanges shall be as required in the pipe schedule. All bolts, nuts shall be Type 316 stainless steel. Gaskets shall be ethylene propylene diene monomer rubber (EPDM).
5. All conduit, fittings, supports, hubs and wiring including wire terminations and terminators necessary for the complete installation of the UV LED modules, instruments, analyzers, devices and HMIs supplied as part of the UV LED System. This includes any additional length of conduit/wiring required to meet actual installation requirements.
6. All the equipment supports, U-bolts, piping/valves and all necessary hardware to install all the ancillary equipment supplied by the UV Supplier. Ancillary equipment shall include control and power panels, and other equipment needed for a fully functional and validated UV LED System.
7. Provide on-site assistance to UV LED Supplier during Functional Testing and Performance Testing as defined in the Performance Test Procedures developed by the UV LED System Supplier and acknowledged by the Owner and Engineer. Develop UV LED System testing schedule that is compatible with overall projects needs for which UV LED Supplier shall follow. Coordinate with Owner regarding availability of process water and flowrate.

C. Contractor shall refer to the UV LED Supplier's Submittal's for additional requirements.

D. Contractor shall prepare and provide as-builts for final P&ID on plans to be furnished to the selected contractor.

2.6 UV LED REACTOR

- A. General Requirements:
1. Materials of Construction: The UV reactor shall be welded Type 316L stainless steel. Each reactor shall be supplied with American National Institute (ANSI) Class 150 flanged inlet/outlet connections. All metal parts in the reactor shall be constructed of Type 316L stainless steel. All nonmetallic materials in the reactor shall be suitable for continuous exposure to UV light.
- B. UV LED Lamp Modules:
1. Quantity: 4. (3 furnished and installed as part of work, 1 complete module on stand-by).
 2. Each module shall be furnished complete along with appropriate fasteners and hardware:
 - a. Integrated cold plate with water loop connections (inlet/outlet), each 1-in MNPT.
 - b. UV LED lamp arrays.
 - c. Integrated control system interface with Modbus TCP interface.
 3. The UV-C LED lamp arrays shall be guaranteed for a minimum number of operation hours prior to lamp output reaching the ELAF. A minimum of four on/off cycles shall be allowable for the lamp modules every 24 hours. At the end of guaranteed lamp life, lamp output weighted for the germicidal emission spectrum (using a weighting equivalent to that used by the UV LED Supplier's intensity sensor), shall be greater than or equal to 90 percent of new lamp output, as measured in the field by the Utility using the UV LED System's UV intensity reference sensors. Thus, lamp life shall be determined by field tests based on intensity sensor readings. At the highest power setting, if the intensity reference sensor reading (or average of all reference sensors) for a clean lamp is less than or equal to 90 percent of the intensity sensor reading(s) for a new lamp, then the end of lamp life shall be considered to have been achieved. If the UV LED Supplier submits an alternative ELAF, then the submitted value shall replace "90 percent" in the previous text.
 6. Manufacturer's unit cost for replacement lamps shall include cost to accept and properly dispose of used lamps.
- C. UV LED Reactor Quartz Sleeve:
1. Optical-grade fused silica conforming to JGS2 standards.
- D. UV LED System Intensity Sensor(s):
1. Only germicidal UV sensors, as defined in the UVDGM, shall be allowed.
 2. A minimum of one duty UV sensor is required per UV LED reactor.
 3. "Wet" Intensity Sensors shall not be used.
 4. Supplier shall guarantee the duty UV intensity sensor calibration interval. If the time between calibrations for a duty UV intensity sensor is less than the guaranteed calibration interval, Supplier shall calibrate the sensor at no cost to the Utility, and shall pay for all sensor shipping charges to and

from the Owner. Determination of a sensor requiring calibration shall be according to the Supplier's standard operating procedures. This guarantee shall apply for a period of 20 years, or until UV intensity sensors that meet the guaranteed calibration interval are provided by Supplier, whichever is later.

2.7 UV LED SYSTEM CONTROLS

A. General:

1. Each UV LED Lamp Module (3 total) shall have an integrated control system with Modbus TCP interface.
2. UV LED System lamp modules shall be pre-wired to the maximum extent possible, requiring only field connections for power and field devices. For communication circuits, provide cable and connectors per device manufacturer's recommendations.
3. Control Components:
 - a. UL Listing Mark for Control Panels: Mark stating "Listed Enclosed Industrial Control Panel" per UL 508A.
 - b. Panel construction and interior wiring in accordance with NFPA 70 (NEC), state and local codes, NEMA, ANSI, UL, and ICECA.
 - c. All electrical components are to be isolated from all wetted parts.
4. UV LED Lamp Module Wiring:
 - a. Internal power and signal wiring shall be the responsibility of the UV LED Supplier.
 - b. UV LED Lamp Module shall have a 1-in push-in conduit connection for power wiring.
 - c. UV LED Lamp Module shall have a 1-in push-in conduit connection for signal wiring/cable.
5. UV LED Lamp Module Cooling:
 - a. Each UV LED Lamp Module (3 to be mounted on UV Reactor) shall have connections for cooling water, which shall consist of a 1-in MNPT inlet and a 1-in MNPT outlet.
 - b. Contractor shall locate the existing 4-in non-potable water line in the vicinity of the UV LED System installation, and shall furnish and install 4-in PVC, Sch. 80 piping, fitting, and appurtenances as shown and specified to the UV LED Lamp Modules (3). Confirm cooling water source and location with Owner and Engineer.
 - c. Contractor shall also furnish and install 1-in PVC, Sch. 80 piping, fittings, and appurtenances for the outlet connection of each UV LED Module, and shall discharge to the nearest drain or sump. Confirm discharge location with Owner and Engineer.

2.8 PLANT SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) PLC

- A. Remote control of the UV LED System shall be allowed through the Main Plant SCADA PLC. The following functions will be provided by the Owner from the Main Plant SCADA to the UV LED Lamp Modules (3):
 - 1. Digital Control: UV LED System Run (Request), UV LED System Stop (Request), Sequence Mode Selection, along with general functions (general warning alarm reset, etc.).
 - 2. Analog Control: Required Flow and Required UV Dose.
- B. Signal Wiring and Conduit
 - 1. Contractor shall coordinate work with the Owner prior to the start of demolition work.
 - 2. Owner will be responsible for required integration/programming of the Main Plant's SCADA system.
 - 3. Contractor shall be prepared to remove all existing UV LED System signal wiring and conduit back to the Main Plant SCADA in the Operator Control Room of the Main Treatment Building (2nd floor).
 - 4. The UV LED Reactor (with lamp modules) and the remote HMI panel will be located in the basement of Main Treatment Building.

2.9 INSTRUMENTATION AND CONTROL

- A. Instrumentation and Controls – General:
 - 1. The UV LED Reactor shall have three (3) UV LED Lamp Modules. Each UV LED Lamp Module shall have all control hardware and software contained within the assembly.
 - 2. Provide instrumentation and control for the UV LED System, which allows for the UV disinfection process to be fully automated and deliver the required UV dose under conditions of varying flow rates, UV LED lamp intensity and varying UV transmittance. This shall include the new remote HMI panel near the new UV LED Reactor.
 - 3. The Owner would prefer to have the option to have the most current versions of instrumentation and control components that are available. Contractor shall advise Owner if specified components have a more current version available and the option to have furnished and installed.
 - 4. The Contractor shall advise the Owner and Engineer in advance if the proposed PLC and HMI are manufactured by a firm other than Allen-Bradley (A-B). The Owner can incorporate A-B components into their current SCADA systems and have the licenses to do so along with the training and experience. If the PLC and HMI are to be from a manufacturer other than A-B, then, at the Contractor's expense, the Contractor shall also be responsible for furnishing the Owner the required licenses to integrate, operate, and maintain the systems as well as training specifically on the PLC and HMI for the Owner's personnel.
- B. Make all program functions, I/O addresses and internal registers within PLCs accessible by the Main Plant SCADA system. Coordinate all register units, ranges

and conventions with Installing Contractor's System Integrator to facilitate data exchange. The graphic display screens for the UV LED System HMIs shall match the color usage configuration of the plant SCADA workstations for valve and equipment status. The color green shall be used to indicate a valve is opened or equipment is running. The color red shall be used to indicate a valve is closed or equipment is stopped. The color yellow shall be used indicate a valve is mid travel. General formatting and screen navigation shall be manufacturer standard.

C. Programmable Logic Controllers (PLCs):

1. A controller consists of a power supply, rack, processor module, communication module, I/O modules, removable terminal blocks, slot fillers, and other hardware, as required for a complete and functional system.
2. Quantity: One (1) controller shall be mounted next to the UV LED reactor.
3. Communications Modules: Provide 100/1000 Mbps EtherNet/IP communications channels. Utilize 10/100 Mbps Ethernet communications for all HMIs and to plant SCADA. MOXA, Inc. is preferred.
4. Power Supply Module: As required.
5. Digital Input Module: As required with isolated inputs.
6. Digital Output Module: As required with isolated relay outputs.
7. Analog Input Module: As required with isolated 4-20 mA inputs.
8. Analog Output Module: As required with isolated 4-20 mA or 0-10VDC outputs.
9. Design Requirements:
 - a. Furnish a removable terminal block (RTB) for each I/O module.
 - b. Each chassis shall accommodate a minimum of two future additional I/O modules as shown in the PLC Input and Output List.
 - c. Furnish module slot fillers to reserve module slots for future I/O modules.
 - d. Each I/O module type used shall accommodate a minimum of 20 percent spare I/O points of the total installed I/O points as shown in the PLC Input and Output List, but no less than two spare I/O of each type of I/O module used.
 - e. Furnish one communication module for connection to plant SCADA network.
 - f. Furnish one communication module for connection to controller I/O network as required. I/O network traffic shall be separate from plant SCADA network traffic.
10. Manufacturers and Products:
 - a. Allen-Bradley; ControlLogix L8 or CompactLogix L33 controllers and associated hardware.
 - b. or equal.

D. Human-Machine Interface Unit (HMI):

1. Panel-mounted graphical operator interface capable of bi-directional communication with PLC-based control system.
2. Quantity: One (1) HMI shall be mounted in Remote UV LED HMI Panel.
3. Include all cables necessary to interface with the PLC control system and to a personal computer.
4. Manufacturers and Products:
 - a. Allen-Bradley; PanelView Plus 7 with touch screen only.
 - b. or equal.

E. Control System Hierarchy

1. The UV LED SUPPLIER will apply through hardware, and PLC/HMI software, the following standard control hierarchy/modes to all plant SCADA controlled devices:
 - a. LOCAL – When a controlled device's physical. LOCAL/REMOTE switch is placed in LOCAL, an operator has direct control over each device by means of its physical controls, situated at the device. This mode prevents all SCADA Manual and Automatic control functions. Under all control modes, the SCADA system retains device status monitoring functions. Switching between LOCAL and REMOTE shall be bumpless (retaining the last operational status).
 - b. REMOTE MANUAL (MANUAL) – When the device's physical LOCAL/REMOTE switch is placed in REMOTE, device control has been turned over to the SCADA system, disabling all local controls, except emergency stop and safety related control functions such as hardwired interlocks. A device's AUTO/MANUAL control mode state is retained within its controlling PLC, switchable by software means through HMI based controls. MANUAL software controls mimic the device control features available locally at the device, allowing direct remote control over individual devices. Under normal circumstances, switching between MANUAL and AUTO shall be bumpless, unless the current process state satisfies the pre-defined AUTO control conditions, in which a device or set of devices may start or stop immediately.
 - c. REMOTE AUTO (AUTO) - With the device's LOCAL/REMOTE physical switch remaining in the REMOTE position and its SCADA based control placed in AUTO, a device or a set of associated devices in a larger process unit, will be automatically controlled by logic and associated setpoints within the PLC(s), generally without user intervention. MANUAL controls are disabled. Switching between AUTO and MANUAL shall be bumpless.
 - d. Operator is to have the capability of start/stop equipment set in Manual control mode.

- e. Operator is to have the capability adjust control setpoints and parameters of equipment set in AUTO control mode.
 - f. Operator is to have the capability to open/close valves or adjust the position when applicable.
 - g. Provide safeguards and warnings to prevent an accidental change of state.
2. Functional Requirements:
- a. The UV LED System shall calculate the UV reduction equivalent dose based on the flowrate through the reactor, the UV transmittance, and the UV intensity measurements in the reactor. The UV LED System shall apply the Validation Factor and ASCF (calculated if required) and report the Validated Dose and Log Inactivation of Giardia and Log Inactivation of Cryptosporidium. The UV LED Reactor flowrate shall be hardwired to the CPP's PLC from the flow meters (by others). The UV transmittance signal shall be hardwired to the Local UV LED System PLC and distributed to the individual UV LED System (by UV LED System Supplier).
 - b. The UV LED System shall maintain the required UV dose and log inactivation and send an alarm to the Main Plant SCADA if it is unable to maintain the dose and log inactivation set points.
 - c. The UV LED System shall monitor for equipment failure or malfunction and shut down the reactor in response to such a failure.
 - d. A permissive to start a UV LED Reactor will be provided by the Main Plant SCADA. If permission is given, the UV LED Reactor shall be allowed to warm-up.
 - e. Control and monitoring of the UV LED Reactor effluent flow control valve is to be done by the UV LED System PLC inlet and outlet train. The UV LED Supplier shall coordinate with the Installing Contractor regarding details of interfacing and communications with this equipment. The valves shall be programmed to prevent flows greater than the maximum allowable or maximum validated flow defined by the UV LED Supplier.
 - f. Utilize a non-linear filter to adjust lamp power during rapid changes in flow or UVT to avoid short-periods of off specification water.
 - g. The influent valve upstream of the UV LED Reactor shall be opened prior to activating the UV-C LED lamp arrays and is typically only closed for maintenance.
 - i. The effluent valve downstream of the UV LED Reactor shall not be opened until a SYSTEM READY signal is received from the UV LED System.
 - j. The cooling water valve must be opened prior to activating the UV-C LED lamp arrays to ensure proper cooling of the UV-C LED devices.

- k. In order to provide coordination and synchronization between the alarm displays on both the UV System HMIs and the plant SCADA system, both the UV LED Supplier and the Installing Contractor's System Integrator will provide sufficient synchronization mechanisms and logic within their systems such that all UV LED System HMI and SCADA alarm display and acknowledgement maintains synchronization.
 - l. As a minimum, the UV LED System shall provide the process monitoring and status information to the Main Plant SCADA as listed in the following sections.
 - m. The UV LED System controller shall provide trends showing UV Reactor Flow, UV Transmittance, and UV Dose over time as a minimum.
3. The UV LED Lamp Modules and Remote HMI shall communicate all signals with the Main Plant SCADA.

F. Inputs / Outputs:

- 1. The following signals will be available from the plant SCADA to the UV Lamp Modules via the plant network as a minimum:
 - a. SCADA Heartbeat (e.g. rolling counter).
 - b. SCADA UV to Influent Valve Status (Remote, Opened, Closed).
 - c. SCADA UV to Effluent Valve Status (Remote, Opened, Closed).
 - d. System Required Flow.
 - e. System Required UV Dose.
 - f. System Run Request.
 - g. System Shutdown Request.
 - h. Enable Permissive for UV LED Reactor.
- 2. The following signals are to be sent from the UV LED Reactor and Lamp Modules to the plant SCADA via the plant network as a minimum:
 - a. System Heartbeat (e.g. rolling counter).
 - b. System Remote.
 - c. System Ready.
 - d. System Common Alarm.
 - e. System Sequence Mode Status.
 - f. All general alarms for UV LED Reactor.
 - h. All critical alarms for UV LED Reactor.
 - i. UV ON/OFF for UV LED Module #1, #2, and #3.
 - j. UV Power Level for UV LED Module #1, #2, and #3.
 - k. Lamp Array ON/OFF status for UV LED Module #1, #2, and #3.
 - l. Remote (e.g., control is from plant SCADA) for UV LED Reactor.
 - m. Running Status (on/running, shutdown, ready, offline) for UV LED Reactor.
 - n. Effluent Valve: Status (Remote, Opened, Closed, Position Feedback) for UV LED Reactor.
 - o. Influent Valve: Status (Remote, Opened, Closed) for UV LED Reactor.

- p. Flow (MGD) for UV LED Reactor.
- q. Cumulative Volume (MG) for UV LED Reactor.
- r. Cumulative Off-Spec Volume (MG) for UV LED Reactor.
- s. Intensity for UV LED Reactor.
- t. Reduction Equivalent Dose (MS2 and T1) for UV LED Reactor.
- u. Validated Dose (mJ/cm2) for UV LED Reactor.
- v. Validation Factor for UV LED Reactor.
- w. ASCF for UV LED Reactor.
- x. Log Inactivation of Giardia.
- y. Log Inactivation of Cryptosporidium.
- z. Log Inactivation Virus.
- aa. Lamp Run Time (Hours) for UV LED Module #1, #2, and #3.
- bb. UV Dose Operating Safety Factor (1.XX) for UV LED Reactor.
- 3. As a minimum, the UV LED System shall provide the following critical alarms to the plant SCADA for the UV LED and will automatically shut-down the UV reactor:
 - a. GFI Fault.
 - b. Lamp failure.
 - c. LED driver failure.
 - d. Low water level.
 - e. High reactor/lamp temperature.
 - f. LED driver high temperature.
 - g. Measured flow above validated range (Off-specification event).
- 4. All alarms generated by the UV LED shall be logged and displayed in the Main Plant SCADA system. Each alarm shall be time and date stamped when it occurs.

G. Field Instruments:

- 1. Portable UVT Analyzer:
 - a. Provide one (1) portable or handheld, NIST traceable UVT analyzing device to verify UVT performance in field, as recommended by the 2006 UVDGM.
 - b. Manufacturer:
 - 1) Real Tech/ABB.
 - 2) **or equal.**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The UV LED Supplier shall furnish instructions and supervise the work of the Installing Contractor regarding installation of the UV LED System. The Installing Contractor shall install the UV LED System in strict accordance with UV LED Supplier's instructions.

- B. The UV LED Supplier shall provide direct supervision of the work of the Installing Contractor of the installation of the UV LED System if requested by the Owner, including but not limited to:
 - 1. Direct supervision of installation of the UV LED Reactor, UV LED Lamp Modules, cooling water loop, Remote HMI, and interconnecting control/power wiring.
 - 2. Direct supervision of the work of the Installing Contractor of the installation of UV LED System HMI computers.
 - 3. Verify all field wiring I/O connections made by the Installing Contractor.
 - 4. Inspect, test and verify all communications links from the respective UV LED Lamp Modules and UV Reactor instruments as well as the Remote HMI station to the Main Plant PLC. Inspect, test and verify all LAN communications connections between the UV LED System and the communication switches.
 - 5. Installing Contractor shall provide and install anchor bolts, fasteners, washers, and templates needed for installation of UV LED equipment. The UV LED Supplier shall design and locate anchor bolts and submit this information as part of the UV LED equipment shop drawings, calculations and installation instructions submissions.
 - 6. Provide assistance to Owner for programming modifications required to integrate into the water plant's existing SCADA system.
- C. The UV LWS Supplier shall complete the Manufacturer's Certificate of Proper Installation upon satisfactory installation of the UV LED System.
- D. Refer to General Conditions specifications for additional requirements.

3.2 TESTING - GENERAL

- A. The UV LED Supplier is required to complete the following tests:
 - 1. Factory Acceptance Testing.
 - 2. Functional Testing.
 - 3. Performance Testing.
- B. Refer to General Conditions specifications for general requirements regarding these tests. Additional test requirements are defined below.
- C. The UV LED Supplier shall calibrate all instruments, sensors, and meters supplied for testing, including the UV intensity sensors and power consumption meters.

3.3 FACTORY ACCEPTANCE TEST

- A. The UV LED Supplier shall be responsible for the Factory Acceptance Testing (FAT) that shall be conducted by the UV LED Supplier after the shop drawings are approved and before UV System is shipped to the Site.

- B. The UV LED Supplier shall factory test all major UV LED System components of the UV LED System during a single test session for compliance with the construction and functional requirements specified herein.
- C. The UV LED Supplier shall submit a FAT Plan, for approval by the Owner and Engineer that will demonstrate the full operability of UV LED System. The test plan shall include, but is not limited to the testing of the delivery of the UV Reactor, the UV LED Lamp Modules, the intensity sensors, the Remote HMI Station, the instrumentation and controls for each of the reactors, and operator interface units as well as other equipment and materials to operate and maintain the UV LED System. The test will verify the functions of the UV LED System via simulation or other methods. The PLC and HMI hardware and software is to be set up to allow thorough testing of controls and communications. The scope of the FAT shall demonstrate that each individual component of the UV LED System operates as specified.
- D. For the FAT, the UV LED Supplier is to demonstrate the complete UV LED System. Provide all necessary communications links between the respective panels and computers to simulate the complete UV LED System. The UV LED Supplier shall provide 3 weeks' advance notice prior to conducting the FAT. The Owner and Engineer may elect to witness the FAT. Costs to witness the FAT shall be the responsibility of the Owner.
- E. The UV LED Supplier shall submit a FAT Report discussing the tests performed, items witnessed, and the results for the approval of the Owner and Engineer within 14 days following conclusion of the Factory Test.
- F. The UV LED System components shall not be shipped until the final FAT Report is approved.

3.4 FUNCTIONAL TEST

- A. The UV LED Supplier shall submit a Functional Test Plan, for approval by Engineer that will demonstrate the full operability of UV LED System. The test plan shall include, but is not limited to the testing the full functionality of the UV System. The test will verify the functions of the UV System as installed. The scope of the Functional Test shall demonstrate that each individual component of the UV LED System operates as specified and that the UV LED System operates with the complete treatment plant as specified.

- B. Contractor with Owner for Owner's SCADA representatives to be present for testing, and to make any adjustments to SCADA programming as specified in 3.1 above.
- C. Contractor, with assistance from the UV LED Supplier shall complete all functional testing to the satisfaction of the Engineer and the Owner prior to commencing the Facility Startup. The purpose of the Functional Test shall be to demonstrate the effectiveness of all UV LED System components and control features in all modes of control. Testing shall include:
 - 1. Automatic "start/stop" of UV Lamp Modules by SCADA.
 - 2. Manual "start/stop" of UV Lamp Modules by Remote HMI Station.
 - 3. Automatic shutoff and alarms for various failure modes for UV reactor, including but not limited to loss of UVT or flowrate signals, lamp failure, low **water** level in UV Reactor, high temperature, etc., as listed in section 2.07.F.
 - 4. Monitoring and trending of operating data.
 - 5. Monitoring and control from remote workstation.
 - 6. Bumpless switchover from normal power to emergency power, and emergency power to normal power.
 - 7. Operation of all monitoring instruments.
 - 8. All control functions, both at the Operator Control Room and at the Remote HMI Station.
 - 9. Demonstrate instant restart/unlimited UV LED on/off cycling.
 - 10. Modifying lamp output to verify the UV intensity sensor can detect changes in UV intensity.
 - 11. Modifying flow and UVT to verify UV LED System can modify and maintain adequate UV dose.
 - 12. All specified communications between the UV LED Lamp Modules, Remote HMI Station, and the Main Plant SCADA.

3.5 PERFORMANCE TEST

- A. The UV LED Supplier shall submit a Performance Test Plan for approval by the Owner and Engineer that will demonstrate the full operability of UV LED System. The test plan shall include, but is not limited to demonstrating automatic, manual, and local modes of operation of the UV LED System and continuous operation without the production of off-specification water due to failure of any UV LED System component.
- B. Performance Test shall not commence until after successful completion of Functional Test, approval by Owner/Engineer of Performance Test Plan, and minimum of 100 hours of operating time of entire UV LED System at 100 percent power level. UV LED Supplier shall be responsible for replacing failed components of the UV LED System during this burn-in period at no additional cost to the Owner.

- C. Successful completion of the Performance Test shall be defined as 15 calendar days of continuous operation per UV LED System without the production of off-specification water due to failure of any UV LED System component and demonstration that UV LED System meets all performance requirements established herein. Downtime resulting from Plant's operation, including flow or UVT outside of UV LED System's validated range, will not be counted against the criteria of "continuous days of operation."
- D. The Performance Test shall include normal starts, stops, and changeover to backup UV reactor. Performance Test shall verify normal and emergency (i.e., UV Reactor failure or loss of UVT signal) operation of each installed UV Reactor without malfunction.
- E. The Performance Test shall include headloss check, power consumption check, UVT and intensity sensor calibration checks, power consumption at guaranteed set points, power factor measurements, harmonics measurements, lamp output verification, and UV LED System dose check (based on UV LED System readings and calculations). Specifically include:
1. UV LED Supplier's portable UVT analyzer, and prepare documentation on its compliance with the 2006 UVDGM requirements.
 2. Sensor calibration checks of all supplied/installed duty and reference sensors weekly. Provide uncertainty calculations based on field evaluations. Compare sensor uncertainty based on field evaluations with that provided in the third-party validation. Prepare documentation on the duty UV sensors' compliance with the 2006 UVDGM requirements.
 3. Measure 'S/So' at the beginning of the Performance Test after 100-hr minimum burn-in period. Measure 'S/So' for each lamp in each reactor at the end of the Performance Test. Calculate S/So for each lamp/sensor. Identify any results that are outside of manufacturer expectations.
- F. The UV LED Supplier shall be responsible for coordination and inclusion in the report of all data and results required to meet the reporting requirements whether raw data is contained in UV LED Supplier's PLC or Plant PLCs or SCADA. As a minimum, results shall be provided as follows:
1. Daily tabulated data (provide range and average if applicable) of recorded information.
 2. Energy:
 - a. Average and range of energy consumption per day (data provided by Owner).
 - b. Average energy consumption per volume of net water treated.
 - c. Harmonic testing results showing UV LED System performance measured at 50 percent, 75 percent and 100 percent of UV-C LED lamp module rated load with harmonics (Voltage and Current) measured to the 35th harmonic. Results shall show that the harmonics are below IEEE 519 standards with a Point of Common

- Coupling (PCC) at the input terminals of the UV LED System on utility and emergency generator power.
- d. Power factor of UV LED System throughout the full operating range.
- 3. Headloss: Headloss across each reactor at minimum, average, and maximum flow (if available).
- 4. Other:
 - a. Complete list of parts replaced and reasons for replacement.
 - b. Complete list and results of calibration or other maintenance activities performed and reasons.
 - c. Summary of off-specification occurrences.
 - d. Operating data monitored and recorded by the UV LED System.

3.6 TRAINING OF OWNER'S PERSONNEL

- A. General:
 - 1. Provide for training of designated Owner's personnel in the operation and maintenance of the UV LED System including all components provided under this Contract.
 - 2. Training shall consist of both classroom and hands-on sessions conducted at time and location acceptable to the Owner.
 - 3. Designate a person responsible for scheduling and coordinating all training.
 - 4. Training sessions may be videotaped if the Owner so chooses. If sessions are to be videotaped, UV LED Supplier shall be responsible for providing all necessary videotaping equipment.
- B. UV LED Manufacturer's personnel shall provide detailed system training including, as a minimum, the following:
 - 1. System operations philosophy.
 - 2. System Control:
 - a. Loop Functions: The understanding of loop functions including interlocks.
 - b. Loop Operation: For example, adjusting process variable set points, and control, annunciator acknowledgment and resetting, etc.
 - c. Interfaces with other loops and subsystems.
 - 3. Operator interface/system set points.
 - 4. Component performance requirements.
 - 5. Component functions.
 - 6. Component maintenance.
 - 7. Component troubleshooting.
 - 8. Instrument operation, maintenance, troubleshooting, replacement, and calibration procedures.

- C. Classroom training shall be conducted during regular working hours on weekdays at a location to be designated by the Owner. Hands-on training may be conducted during and as a part of startup. Training shall be repeated in equal morning and afternoon sessions to accommodate Owner's employee's schedules. Provide 10 paper copies of all handouts as well as an electronic copy of materials used for training.
- D. Manufacturer's representative shall be familiar with the O&M requirements as well as with the specified equipment.
- E. Coordinate training periods with Owner's operating personnel and manufacturer's representatives, and with submittal of O&M Manuals.
 - 1. Initial training shall be completed at least 14 days prior to actual startup, but not more than 45 days prior to startup.
 - 2. O&M Manuals shall be reviewed, accepted, and resubmitted in accordance with this section before start of training. Any modifications resulting from startup of the facility shall be incorporated into the final manuals.

3.7 UV LED SUPPLIERS' SERVICES

- A. Provide qualified UV LED Supplier's Representative at site for installation assistance, inspection and certification of proper installation, functional testing assistance, performance testing assistance, and training of Owner's personnel for specified component, subsystem, equipment, or system.
- B. UV LED Supplier's Representative: Present at project site or classroom designated by the Owner for minimum person-days listed below, travel time excluded:
 - 1. 1-person-day and 1-trip for inspecting mechanical, electrical, and control system installations prior to testing and startup.
 - 2. 5-person-days in 1 trip for Functional Testing.
 - 3. 5-person-days in 1 trip for Performance Testing.
 - 4. 4-person-days in 2 trips for pre- and post-startup training of UV System for Owner's personnel. At least 2 sessions should be scheduled to accommodate staff scheduling and availability.
- C. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by the Owner and Engineer.

3.8 EQUIPMENT GUARANTEE

- A. Guarantee each item of mechanical and electrical equipment, instruments and device furnished under this Contract against defects including, but not limited to, the following:
 - 1. Defective material or workmanship of both.

2. Leakage, breakage or other failure which might occur under normal and proper operation of the equipment under the specified conditions.
 3. UV Lamp Module failure, as defined herein, during the Guaranteed Life.
- B. Provide a guarantee for a period of two (2) years from acceptance of the Performance Test based on an approved Test Report and Substantial Completion.
- C. Replace each item of equipment or part thereof proving to be defective.
- D. Bear the entire expense of replacement including, but not limited to, the cost of all necessary labor, supervision, traveling, replacement parts, transportation and shipping cost. Supplier to coordinate and facilitate all work.
- E. The UV LED Supplier shall warrant the Lamp Modules, internal power and signal components, and UV Sensors for the Guaranteed Life following final acceptance after Substantial Completion.
1. If the UV LED Supplier is not the item's Manufacturer, the Warranty shall be provided, in writing, directly to the Owner by the item's Manufacturer.
- F. UV LED Lamp Modules:
1. The LED lamp arrays, integral with the UV Lamp Modules, shall be warranted for at least 8,760 hours and prorated after 2,000 hours. If a lamp fails within the initial prorated period, the UV LED Supplier shall provide a replacement lamp to the Owner free of charge. If a lamp fails after the initial prorated period (e.g. 2,000 hours) and before the guaranteed life (e.g. 8,760 hours), the following formula will be used to determine the discounted price for replacement lamps:
$$\text{Lamp Price} = ((\text{Lamp Operating Hours} - \text{Initial Proration}) / [\text{Guaranteed Life} - \text{Initial Proration}]) \times \text{Guaranteed Price}$$
- G. UV Sensors:
1. The duty and reference UV sensors shall be warranted for a minimum of 5 years and prorated after 1 year. If a sensor fails within the initial proration period, the UV LED Supplier shall provide a replacement sensor to the Owner free of charge. If a sensor fails after the prorated period (e.g., 1 year) and before the guaranteed life (e.g., 5 years), the following formula will be used to determine the discounted price for replacing a sensor:
$$\text{Sensor Price} = ((\text{Sensor Age} - \text{Initial Proration}) / [\text{Guaranteed Life} - \text{Initial Proration}]) \times \text{Guaranteed Price}$$

3.9 UV LED SYSTEM SERVICE AND MAINTENANCE CONTRACT

- A. On the date of acceptance after performance testing the UV LED System Supplier shall provide a one year, renewable at the option of the Owner, service and

maintenance contract. The contract price shall be renewable for up to an additional four (4) years at the option of the Owner. The service and maintenance contract scope shall be outlined in a proposal submitted by the UV LED System Supplier and shall include, as a minimum, the following items listed herein:

- a. Annual equipment maintenance check on all instrumentation devices, monitors, local programmable controllers, local instrument loops, and electrical equipment of the ultraviolet disinfection system equipment components furnished.
- b. Replacements parts, including but not limited to lamps, sleeves and ballasts, will be provided by the UV LED System Supplier on an as-needed basis. The Owner will inform the UV LED System Supplier when minor alarms of the UV LED System occur in order to have the replacement parts on site in a timely manner. The Owner will also maintain spare parts, including one complete UV LED Lamp Module, which shall be replenished by the UV LED System Supplier when used.
- c. Twenty-four hour per day availability to provide verbal direction and response to troubleshooting inquiries regarding equipment furnished.
- d. Annual tuning of the UV LED System to optimize system performance and inspection of the UV LED System to determine the need for cleaning. If cleaning is required, the UV LED Supplier shall supervise the cleaning operations performed by Owner's personnel.
- e. Annual training of Owner's staff, particularly management, operating, and maintenance personnel, covering the operation and maintenance of the complete UV LED System.

****END OF SECTION** -**

SECTION 150600

SUPPORTS AND ANCHORS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing all hanging and supporting devices of construction shown, specified, or required for pipelines, apparatus, and equipment other than electrical equipment.
- B. Related work specified in other sections includes:
 - 1. Section 099000 – Paintings and Coatings
 - 2. Section 150650 – Ductile Iron Pipe and Fittings
 - 3. Section 150670 – PVC Piping and Tubing
 - 4. Section 151090 – Erecting and Jointing Interior Piping

1.2 REFERENCES

- A. Codes and standards referred to in this section are:
 - 1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, 800
 - 2. ASME B31.1 - Power Piping (includes Revision Service)
 - 3. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - 4. MSS SP-58 - Pipe Hangers and Supports – Materials, Design and Manufacture
 - 5. MSS SP-69 - Pipe Hangers and Supports – Selection and Application
 - 6. MSS SP-89 - Hangers and Supports – Fabrication and Installation Practices
 - 7. MSS SP-90 - Guidelines on Terminology for Pipe Hangers and Supports

1.3 SUBMITTALS

- A. Provide submittals for items and materials specified herein in accordance with Section 013000 for review and approval by the Owner and Engineer. Submittals shall be provided for the following, but not limited to:
 - 1. Product data, catalog figures delineating type and style
 - 2. Materials of construction
 - 3. Load charts depicting product capability

1.4 SYSTEM DESCRIPTION

- A. General: System includes supporting devices adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating and testing conditions with due allowance for expansion and contraction.
- B. Design Requirements: Design supporting devices in accordance with the best practice and provide supporting devices that are not unnecessarily heavy. Design supporting devices to accommodate loads imposed during leakage tests for the test pressures specified. Base the required strength of supporting devices on the combined weight of the piping and connected equipment, the weight of the denser of the fluids used in operations or testing and the weight of insulation where applicable.
- C. Provide springs where necessary. Make hangers and supports of standard design where possible and best suited for the service required. Include proper pipe protection saddles for hangers and supports on pipes which are covered with insulation. Where required, make supports screw adjustable after installation unless approved otherwise.
- D. Provide spring hangers at points that are subject to vertical thermal movement or as shown. Provide pre-engineered type spring hangers with housed and guided spring coils as recommended by the manufacturer. Provide load indicator, load scale on an identification plate and a rod turnbuckle for each spring hanger. Provide spring hangers capable of accommodating at least 1-1/4 inches of deflection to solid compression.
- E. Interference: Design all supporting devices so as to minimize interference with access and movement. Eliminate the potential for injuries due to protruding supporting devices.
- F. Sizing: Provide base piping support, hanger rod size, brackets and spacing meeting the requirements of ASME B31.1, MSS SP-58, SP-69, SP-89 and SP-90 except as modified herein.
 - 1. Modify hangers for plastic pipes to increase the bearing area by inserting a protective sleeve of medium-gauge aluminum sheet metal between the pipe and the hanger.
 - a. Align hangers such that no sharp edges come in contact with the pipe.
 - b. Provide a wooden or thermoplastic pad between the plastic pipe and any concrete or masonry surface.
 - c. Use supports for vertical lines of a type which do not exert a compressive strain on the pipe. Riser-type clamps that squeeze the pipe will not be permitted.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 and per manufacturer recommendations.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers:
 - 1. Pipe hangers and supports
 - a. Anvil International
 - b. Globe Pipe Hanger Products, Inc.
 - c. or approved equal.

2.2 MATERIALS

- A. Support overhead hangers using threaded rods properly fastened in place by suitable screws, clamps, inserts, bolts, or by welding. Subject hangers to tensile loading only. Where lateral or axial movement may occur, provide suitable linkage to permit sway.
- B. Suspended Piping: Support suspended piping by adjustable ring or clevis hangers and threaded rods from heavy duty concrete inserts or other fastening devices, except as otherwise specified or noted.
- C. Brackets: Make brackets of welded steel and designed for the following load classifications.

Load Classification	Maximum Load per Bracket
Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

- 1. When medium or heavy brackets are bolted to vertical surfaces, furnish and install backplates of adequate size and thickness to distribute the load against the vertical surfaces.
 - 2. When the use of backplates is not practicable, fasten the brackets to the vertical surfaces in such a manner that the safe bearing strength of the vertical surfaces will not be exceeded.
- D. Chairs and Pipe Rolls: Use cast-iron pipe rolls or chairs. Provide pipe rolls with threaded nuts or with sockets to take threaded rods.
- E. Saddle Stands: Use adjustable saddle stands.
 - 1. Provide each stand with a length of steel pipe fitted at the base with standard threaded cast-iron flange or steel base plate and at the top with an adjustable saddle or roll. Bolt the base flange or plate to the floor, foundation or concrete base.
 - 2. Use stanchions of construction similar to the saddle stand, except fit them at the top with cast-iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.

- F. Insulation Support Requirements: At support points, protect insulated pipes by a 360 degree insert of high density, 100 psi, waterproofed calcium silicate encased in a 360 degree sheet metal shield.
 - 1. Make inserts of the same thickness as the adjoining pipe insulation.
 - 2. Provide the shield length, minimum galvanized sheet metal gauge and installation procedure in accordance with the manufacturer's recommendations.
 - 3. Extend insulation inserts one inch beyond the sheet metal shields on cold water lines, and jacket and vapor seal as required when the abutting insulation is installed.
- G. Expansion: Connect, support and guide piping to permit and control pipe expansion and contraction and to accommodate building expansion, contraction and settling without damage to the piping or support system.
 - 1. Furnish and install anchors when specified, shown, or required for holding the pipelines and equipment in position or alignment. Design anchors for rigid fastening to the structures, either directly or through brackets.
 - 2. Provide cast-iron chair type anchors for piping with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.
 - 3. Inserts: Provide galvanized concrete inserts.
 - a. Design inserts to permit the rods to be adjusted horizontally in one plane and to lock the rod nut or head automatically.
 - b. Recess inserts near the upper flange to receive reinforcing rods.
 - c. Design inserts so that they may be held in position during concrete placing operations. Design inserts to carry safely the maximum load that can be imposed by the rod which they engage.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install hanger and supports in accordance with the manufacturer's recommendations, the Contract Documents, and approved submittals as well as Specification Section 151090.

3.2 PAINTING

- A. Painting: Paint hangers, supports, anchors, and similar devices as specified in Section 099000.
- B. Touch-Up Painting: Clean and touch-up painting of field welds, bolted connections and abraded areas as specified in Section 099000.

****END OF SECTION****

SECTION 150650

DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope
 - 1. Contractor shall furnish all labor, materials, equipment and incidentals as shown, specified, and required to provide ductile-iron pipe, fittings, and specials necessary for the filter effluent piping modifications.
 - 2. The extent of the piping work includes, all process piping as shown on the Drawings.
- B. Related Work Specified Elsewhere:
 - 1. Section 099000 – Painting and Coatings
 - 2. Section 137000 – UV Disinfection System
 - 3. Section 150600 – Supports and Anchors
 - 4. Section 151000 – Valves, Specials, and Appurtenances
 - 5. Section 151090 – Erecting and Jointing Interior Piping

1.2 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Obtain each type pipe and fittings from no more than one manufacturer.
 - 2. Pipe shall be manufactured at plants in the United States of America which shall have permanent quality control departments and laboratory facilities capable of performing the inspections and testing required by the Contract Documents. Pipe manufacturer shall perform all tests and inspections required by AWWA C151 (except as modified herein) and these Specifications
 - 3. Inspect and test at foundry according to applicable standard specifications. Visually inspect and hammer test before shipping.
 - 4. All sampling, testing, inspection procedures and process of manufacture shall be subject to inspection by the Owner and/or Engineer at any time. Owner reserves the right to test by independent service at manufacturer's plant or elsewhere at his own expense.
- B. Regulatory Requirements:
 - 1. Comply with applicable KDW regulations.
 - 2. Comply with applicable NKWD regulations.
 - 3. Comply with NSF Standard 61 for materials in contact with potable water.

- C. Marking for Identification: The name or trademark of the pipe manufacturer and the date and place of manufacture, and coating and lining information shall be stenciled on all materials. Should the coating or lining be applied at another facility, the name or trademark of the applicator shall also be stenciled on the pipe.
1. The pipe shall have the design working pressure and thickness or and accepted letter designation stenciled thereon. A serial number or other identification shall be conspicuously painted on each section of pipe, fitting, or special. The serial number shall be used to track the pipe through the manufacturing process and shall appear on all appropriate test reports.
 2. The pipe that has been designed for abnormal load conditions shall have special markings, which can be readily identified together with any special station requirements.
- D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. AWWA C100, Cast-Iron Pressure Fittings.
 2. AWWA C104/ANSI A21.4, Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water.
 3. AWWA C110/ANSI A21.10, Gray-Iron and Ductile-Iron Fittings, 2 in. through 48 in., for Water and Other Liquids.
 4. AWWA C111/ANSI A21.11, Rubber Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings.
 5. AWWA C115/ANSI A21.15, Flanged Cast-Iron and Ductile-Iron Pipe with Threaded Flanges.
 6. AWWA C150/ANSI A21.15, Thickness Design of Ductile-Iron Pipe.
 7. AWWA C151/ANSI A21.51, Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids.
 8. AWWA C153/ANSI A21.53, Ductile Iron Pipe Compact Fittings, 3-inch through 16-inch for Water and Other Liquids.
 9. AWWA C651, Disinfecting Water Mains.
 10. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings.
 11. ANSI B18.2.1, Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Lag Screws.
 12. ANSI B18.2.2, Square and Hex Nuts.
 13. ASTM A 307, Carbon Steel Externally and Internally Threaded Standard Fasteners.
 14. ASTM A 354, Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
- E. Acceptable Manufacturers of Ductile Iron Pipe and Fittings:
1. American Cast Iron Pipe Company
 2. U.S. Pipe and Foundry Company
 3. Griffin Pipe Product Company

4. or approved equal.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval detailed drawings and data on pipe, fittings, gaskets, and appurtenances. Submit these Shop Drawings required under Section 013000 and other applicable sections of the Contract Documents for review and approval by the Owner and Engineer.
 1. Manufacturer's Literature: Including, but not limited to, catalog cuts of joints, couplings, harnesses, expansion joints, gaskets, fasteners, and other accessories.
 2. Piping layouts in full detail, including laying schedule where appropriate.
 3. Location of pipe hangers and supports.
 3. Location and type of joint restraint (if applicable).
 4. Large scale details of wall penetrations and special castings.
 5. Schedules of all pipe, fittings, special castings, couplings, expansion joints, and other appurtenances.
 6. Gasket samples.
- B. At the request of the Owner and Engineer, Contractor shall be prepared to submit:
 1. Certificates: Sworn and notarized certificates in duplicate of shop tests showing compliance with appropriate standard.
 2. Certificates: Submit certificates of compliance with referenced standards.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Handle all pipe, fittings, and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll, or skid pipe. Materials that are cracked, chipped, gouged, dented, or otherwise damaged will not be approved for installation.
- B. Store pipe, fittings, and appurtenant materials in a manner which will protect them from becoming dirty or damaged prior to installation. Store pipe and fittings on heavy wood blocking or platforms. Do not store pipe in contact with ground. Store coated pipe on padded 4-inch wide (minimum) skids or select loamy areas. Coated pipe shall not be laid on pavement without benefit of padding at contact points.
- C. Pipe, fittings, and appurtenant materials which are visibly dirty shall be cleaned to the Engineer's satisfaction or replaced at the Contractor's expense prior to installation.
- D. Shipments of materials to Contractor or Subcontractor shall be delivered to the site only during regular working hours. Shipments shall be addressed and

consigned to the proper party giving name of Project, location and city. Shipments shall not be delivered to Owner except where otherwise directed.

- E. If necessary to move stored materials and equipment during construction, Contractor shall move or cause materials and equipment to be moved without any additional compensation.
- F. Coordinate deliveries to avoid conflict with Work and conditions at site. Arrange deliveries of products in accordance with construction schedules to facilitate inspection prior to installation. Do not have products delivered to Project site until related Shop Drawings have been approved by the Engineer.
- G. Coated pipe shall be handled and stored in such a manner as to protect the pipe and the coating from damage. Use web slings or forklifts to handle the pipe. Web slings shall be of a type and width that will not damage the coating. Slings shall not pass through the pipe. Metal chains, cable tongs or other equipment likely to cause damage to the coating shall not be used. Hooks shall not be used on the ends of the pipe. If cables or chains are used during transportation, they must be properly padded with approved suitable material to protect the coating from damage. Use padded separator strips between pipe. Where forklifts are used, their bearing surfaces must be padded with suitable material.
- H. Materials cracked, gouged, chipped, dented or otherwise damaged will not be accepted. Minor defects in the pipe or coatings may be repaired at the site by a method approved by the manufacturer of the materials and by the Engineer. Damaged pipe, fittings, specials and accessories shall be repaired at Contractor's expense.

PART 2 - PRODUCTS

2.1 PIPE

- A. Ductile Iron Pipe and Fittings:
 - 1. Design conforming to ANSI A21.50.
 - 2. Manufacture conforming to ANSI A21.15 or ANSI A21.51.
 - 3. Thickness class, unless otherwise indicated or specified:
 - a. Minimum thickness Class 51.
 - b. Minimum thickness Class 53 for use with threaded flanges.
 - 4. Pressure rating: All piping and fittings associated with the high service pump replacement shall be rated for a pressure class of at least 250 psi.

2.2 PIPE FOR USE WITH COUPLINGS

- A. As specified above except ends shall be plain.
- B. With sleeve couplings, ends cast or machined at right angles to axis.

2.3 FITTINGS

- A. Provide cement lined ductile iron fittings conforming to ANSI A21.10 or ANSI A21.53, at least Class 250 unless otherwise indicated.
- B. Face and drill flanged fittings conforming to ANSI A21.10 except special drilling or tapping as necessary for correct alignment and bolting.
- C. Provide standard base fittings where indicated.

2.4 JOINTS

- A. Provide pipe flanges and accessories conforming to ANSI A21.15, where indicated.
 - 1. Provide flat faced flanges.
 - 2. Provide 1/8 in. thick, full faced gaskets suitable for exposure to liquid within pipe.
- B. Restrained joint pipe and fittings shall be utilized for thrust restraints at no additional cost to the Owner. Contractor shall submit design calculations for restrained joint pipe lengths required. Provide restrained joint which is:
 - 1. Boltless.
 - 2. Capable of being deflected after assembly.
 - 3. Designs using set screws or requiring field welding are not acceptable.

2.5 SLEEVE-TYPE COUPLINGS

- A. Furnished by pipe supplier.
- B. Pressure rating at least equal to that of related pipeline.

2.6 STANDARD LINING AND COATING

- A. Inside of Pipe and Fittings: Provide double thickness cement lining and seal coat conforming to ANSI A21.4.
- B. Machined surfaces shall be cleaned and coated with suitable rust-preventative compound at shop.

- C. Outside of Other Pipe and Fittings: Standard bituminous coating conforming to appropriate ANSI standard.

2.7 GASKETS, BOLTS, AND NUTS

- A. Provide ring rubber gaskets with cloth insertion for flanged joints, neoprene faced phenolic for insulating gaskets.
 - 1. Gaskets 12 in. in diameter and smaller: 1/16 in. thick.
 - 2. Larger than 12 in: 1/8 in. thick.
- B. Make flanged joints with:
 - 1. Bolts.
 - 2. Bolt studs with nut on each end.
 - 3. Studs with nuts where flange is tapped.
- C. Number and size of bolts conform to same ANSI as flanges.
- D. Bolts, nuts, washers, and other fasteners shall be Type 316 stainless steel.

PART 3 - EXECUTION

3.1 INSPECTION BEFORE INSTALLATION

- A. Inspect materials for cleanliness and absence of damage. Visually inspect for damage, cracks, coating uniformity, markings, debris, gasket integrity, and all other attributes of the manufacturers' recommended pipe design conditions. Hammer test as required.
- B. Verify existing field conditions prior to procuring materials and installation. Annotate any deviations or modifications on as-built/record drawings.

3.2 INSTALLATION

- A. General:
 - 1. Remove and replace defective pieces.
 - 2. Clear of all debris and dirt before installing and keep clean until accepted. Clean off rust and scale before setting.
 - 3. Install materials as shown, specified, recommended by the manufacturer and in conformance with reference standards and accepted Shop Drawings.
 - 4. Take field measurements as necessary to ensure proper fitting of Work. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.

- B. Joining Pipe and Fittings:
1. When joining pipes and fittings, the work shall be done in strict accordance with the requirements of AWWA C600, the manufacturer's printed instructions, approved submittals and these Specifications.
 2. Flanged joints: shall be assembled with general procedure to be as follows:
 - a. Prepare flanges in accordance with the requirements of this Specification Section.
 - b. The flanges shall be accurately aligned, using a spirit level, and pipe properly supported before the gasket and bolts are inserted. The rubber gasket shall be carefully placed to ensure full flow and proper sealing of the joint.
 - c. Bolt threads shall be given a light coat of thread lubricant and then inserted and the nuts turned up by hand. Bolts shall then be pulled up with a wrench employing the crossover method. Applied torques shall be in strict accordance with the manufacturer's requirements.
- C. Piping Support:
1. Furnish and install supports to hold piping at lines and grades indicated or specified.
 2. Support pipe and appurtenances connected to equipment to prevent any strain imposed on equipment.
 3. Support piping within buildings and structures from floors, walls, ceilings, or beams. For floor support, use saddle stands or concrete piers as indicated. Construct concrete piers to conform accurately to the bottom one-third to one-half of pipe. Support piping along walls by wall brackets with attached pipe rolls, saddles, or with adjustable hanger rods.
 4. Use hangers and supports conforming to MSS-SP-58.
- D. Socket Pipe Clamps, Tie-rods, and Bridles: Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, provide suitable socket pipe clamps, tie-rods, and bridles. Use bridles and tie-rod at least $\frac{3}{4}$ in. in diameter except where they replace flange bolts of smaller size with nut on each side of flange pairs.

3.3 CONNECTIONS TO EXISTING FINISHED WATER PIPING

- A. General: The Contractor shall connect to the existing finished water piping, as shown on the Drawings. If system shutdown is necessary, the Contractor shall give the Owner and Engineer sufficient notice before these operations are to be performed so that advance notice may be given to the affected customers.
- B. The Owner will close all valves in making shutdown and open all valves in restoring pressure to the existing main and initiating pressure in the new

installation. Connections to the existing finished water piping shall be made by the Contractor only after complete preparation for such Work has been made, in order that the duration of the shutdown may be as short as possible.

3.4 TESTING OF PRESSURE PIPE

A. General:

1. Test all piping as specified below and in accordance with AWWA C600 (ductile iron), latest version.
2. Notify Owner and Engineer at least 24 hours in advance of testing.
3. Provide all testing apparatus including pumps, hoses, gages, and fittings.
4. Pipelines shall hold the specified test pressure for a period of two (2) hours.
5. Pipelines which fail to hold specified test pressures or which exceed the allowable leakage rate shall be repaired and retested.
6. Test pressures required are at the lowest elevation of the pipeline section being tested, unless otherwise specified.
7. Unless otherwise approved, conduct all tests in the presence of the Owner and Engineer. Repeat tests in the presence of local authorities having jurisdiction if required by them.

B. Schedule of Pipeline Tests: 150 psi, or 1.5 times the working pressure whichever is greater.

C. Pressure Test Procedure:

1. Ensure that all supports and restraint protection are securely in place.
2. Fill section to be tested slowly with water and expel all air. Install cocks if necessary to ensure removal of air. Test only one section of pipe at a time.
3. Apply test pressure required for one hour and observe pressure gage. Check carefully for leaks while test pressure is being maintained.

D. Leakage Test Procedure:

1. Conduct leakage test on all liquid piping after satisfactory completion of pressure test.
2. Maintain test pressure constantly for a two (2) hour period and accurately measure the amount of water which must be added to maintain the test pressure.
3. Allowable leakage rates (in gallons per hour per 1,000 feet per inch diameter):

a. Ductile Iron Piping:
$$L = \frac{S \times D \times \sqrt{P}}{148,000}$$

where, L = testing allowance (makeup water), gph
S = length of pipe tested, ft

D = nominal diameter of the pipe, in
P = average test pressure during the hydrostatic test, psi
(gauge)

3.5 DISINFECTION

- A. All piping shall be thoroughly cleaned and flushed prior to placing in service in a manner approved by Owner and Engineer.
- B. Disinfect potable and finished water piping using procedures and materials conforming to AWWA C651.
- C. Owner will furnish sodium hypochlorite product (12.5% NaOCl) for disinfection and the appropriate MSDS to the Contractor. Contractor shall be responsible for diluting/mixing the sodium hypochlorite and water to create a 1% solution for spraying or swabbing.
- D. Bacteriological tests will be performed by a third party, State-approved testing agency paid for by the Contractor.

3.6 FIELD PAINTING

- A. Refer to Section 099000.

* * END OF SECTION * *

SECTION 150670

PVC PIPING AND TUBING

PART 1 – GENERAL

1.1 SUMMARY

- A. Scope:
 - 1. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install and place in satisfactory service polyvinyl chloride (PVC) piping and miscellaneous tubing along with associated appurtenance, fittings and specials.
 - 2. In most instances, the piping and tubing shown on the Drawings are provided to demonstrate the intent of the installations and not necessarily the actual installation. Confirm piping layouts with Owner and Engineer.
 - 3. Unless otherwise shown or specified or agreed to by the Owner and Engineer prior to installation, no threaded or flanged connections shall be utilized.
- B. Coordination: Review installation procedures under other sections and coordinate with the Work that is related to this section.
- C. Related work specified in other sections includes:
 - 1. Section 150600 – Hangers and Supports
 - 2. Section 151000 – Valves, Specials, and Appurtenances
 - 3. Section 151090 – Erecting and Jointing Interior Piping

1.2 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer shall have a minimum of five (5) years of experience in the production of PVC pipe and fittings, and, if requested, shall show evidence of satisfactory service in at least five (5) installations.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. ASTM D 1598 - Test for Time-to-Failure of Plastic Pipe under Constant Internal Pressure
 - 2. ASTM D 1599 - Test for Short-Time Rupture Strength of Plastic Pipe, Tubing and Fittings
 - 3. ASTM D 2122 - Determining Dimensions of Thermoplastic Pipe and Fittings
 - 4. ASTM D 1784 - Rigid Poly(Vinyl Chloride) PVC Compounds and Chlorinated Poly(Vinyl Chloride) CPVC Compounds

5. ASTM D 1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120
6. ASTM D 2467 - Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings
7. ASTM D 2564 - Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
8. ASTM F 439 - Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
9. ASTM F 441 - Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
10. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
11. ASTM F 493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings
12. Standard No. 14 - National Sanitation Foundation
13. American National Standards Institute

- C. Shop Tests: Piping manufacturer shall maintain a continuous quality control program. All PVC and CPVC plastic molding materials used to manufacture pipe and fittings under this section shall be tested for conformance to the requirements of ASTM D 1784 and ASTM D 1785.

1.3 SUBMITTAL

- A. Shop Drawings: Submit for approval the following in accordance with Specification Section 013000:
1. Detailed procedures to be used in jointing and installing piping system including manufacturer's recommendations.
 2. Interfacing of piping system to equipment and appurtenances.
 3. Detail requirements for burial, supports, anchors, guides, expansion joints, and all accessories required for a satisfactory piping system.
 4. Bill of materials, indicating material composition of pipe and solvent, pressure rating, nominal size and its location on the piping installation drawings.
 5. Certification letter from pipe manufacturer confirming that the materials to be used are suitable for the intended service.
- B. Certificates: If requested by the Owner and Engineer, submit certificates of compliance with referenced standards.

1.4 PRODUCT DELIVERY, HANDLING, AND STORAGE

- A. Delivery: All necessary precautions shall be taken to prevent damage to pipe fittings and other materials during shipment and delivery. All materials shall be securely fastened to truck or rail car to prevent movement or damage during shipment. An inspector shall examine all materials before unloading.

- B. Handling: All pipe materials shall be handled to prevent damage. Pipe and fittings shall not be dropped, rolled, or pushed off from any height on delivery, storage or installation.
- C. Storage: All pipe materials shall be stored off the ground. Pipe ends shall be secured by caps or plugs. Pipe shall be stored in enclosures or under protective coverings, in dry locations. Pipe shall be stored to prevent sagging or bending.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. PVC Pipe:
 - 1. PVC pipe shall be Schedule 80, Class 12454-B, conforming to ASTM D 1784 and ASTM D 1785.
 - 2. Fittings: Fittings and specials for PVC pipe shall be Schedule 80, solvent weld type and shall conform to ASTM D 2467 for socket type. Provide flanged fittings where shown on the Plans with Teflon filled gaskets. Solvent cement shall conform to requirements of ASTM D 2564.
- B. PVC Tubing:
 - 1. Where indicated on the Plans, clear polyester reinforced PVC tubing shall be furnished and installed.
 - 2. Inside Diameter (ID): 3/8 inch
 - 3. Max. Working Pressure (@ 70 deg F): 250 psi
 - 4. NSF 61 listed.

2.2 DETAILED REQUIREMENTS

- A. PVC Piping:
 - 1. Workmanship: The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other defects. The pipe shall be uniform in color, opacity, density, and other physical properties.
 - 2. Dimensions and Tolerances: Dimensions and tolerances shall be measured in accordance with ASTM D 2122. The eccentricity of the inside and outside circumferences of the pipe walls shall not exceed 12%.
 - 3. Sustained Pressure: The pipe shall not fail, balloon, burst, or weep as defined in ASTM D 1598.
 - 4. Burst Pressure: The minimum burst pressure shall be determined in accordance with ASTM D 1599.
 - 5. Marking: Marking on the pipe shall include the following, spaced at intervals of not more than 5 feet.
 - a. Pipe nominal size
 - b. Pipe schedule
 - c. Specification of plastic material

- d. Type and grade of plastic
- e. Date and place of manufacture
- 6. Piping and fittings shall be manufactured with a minimum of 2% of titanium oxide for ultraviolet protection.
- 7. Pipe and fittings socket type with solvent cement joints.
- 8. Flanges shall only be used where shown on the Plans or as agreed to by the Owner and Engineer.
- 9. Unions shall be used to facilitate removal around valves, equipment or pipeline appurtenances. Unions shall only be used where shown on the Plans or as agreed to by the Owner and Engineer.

2.3 ADAPTERS

- A. Where required to join piping of different materials, the Contractor shall provide the necessary adapters, as recommended by the thermoplastic pipe and/or tubing manufacturer.
- B. Special transition fittings shall be used to connect to pipe valves or equipment with screws or bolts. No threading of PVC pipe will be allowed.
- C. Hangers and supports used with PVC pipe and/or tubing will be specially designed with components to provide long term protection and support.

PART 3 – EXECUTION

3.1 GENERAL

- A. Refer to Section 15109 for piping installation, testing, cleaning and acceptance.
- B. Coordinate with the Engineer before proceeding if there is a conflict between Contract Documents and manufacturer's recommendations.
- C. Pipe, fitting and accessories that are cracked, damaged, not identified or in poor condition will be rejected and replaced at no additional cost to the Owner.

3.2 INSPECTION

- A. Examine areas to receive piping for:
 - 1. Defects that adversely affect execution and quality of work.
 - 2. Deviations beyond allowable tolerances for piping clearances.
- B. Start work only when conditions are corrected satisfactorily.

3.3 INSTALLATION

- A. Piping Layout
 1. Complete installation to present a neat, orderly appearance.
 2. Do not block openings or access to equipment or other piping.
 3. Generally install per the Plans. Confirm deviations with the Owner and Engineer prior to installation, including proposed support locations.

- B. PVC Tubing Layout:
 1. Complete installation to present a neat, orderly appearance.
 2. Do not block openings or access to equipment or other piping.
 3. Generally install per the Plans. Confirm deviations with the Owner and Engineer prior to installation, including proposed support locations and wall penetrations.

- B. Erection
 1. Vertical Piping: Secure at sufficiently close intervals to keep pipe in alignment and to support weight of pipe and contents.
 3. Cutting
 - a. Cut plastic pipe with a hand saw.
 - b. Make cuts square with pipe.
 - c. Remove burrs by smoothing edges with a knife, file, or sandpaper.
 4. Jointing
 - a. Assembled with solvent cemented joints.
 - b. Clean edges thoroughly and apply primer.
 - c. Apply cement recommended by manufacturer. Follow recommendations for making joints.
 - d. Flanged joints made complete with 1/8 inch thick soft rubber gaskets. Gaskets shall be suitable for use in sodium hypochlorite (<15%) applications.
 5. PVC Tubing:
 - a. Refer to the Plans for proposed jointing methods for transitions between tubing for the chemical pumps (refer to Specification Section 11365) and rigid PVC piping.
 - b. Cut tubing with a sharp utility knife or similar. Ensure the cut tubing is square and the edges are smooth.
 6. Piping Labels and Identification:
 - a. PVC Piping: Piping shall be labeled and identified. Confirm with the Engineer the Plant's standards for labeling chlorine feed lines and the labels to be used. The direction of flow shall be indicated.
 - b. PVC Tubing: Tubing shall be tagged and labeled as indicated on the Plans, including the spare lines (supply and return).

- C. Supports
 1. Supports shall not rigidly hold the pipe from axial movement.

2. Maximum support spacing for plastic pipe shall be four (4) feet for PVC piping and tubing.
3. Refer to the Plans for additional information and details about piping and tubing supports.

3.4 FIELD QUALITY CONTROL

- A. Cleaning of all PVC pipelines performed, followed by blowing with air compressor.

****END OF SECTION****

SECTION 151000

VALVES, SPECIALS, AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - a. Fort Thomas Diversion Piping: This work will be bid as an add alternative bid item and shall be performed only if authorized by the Owner to include the project.
 - b. If authorized, Contractor shall furnish all labor, materials, equipment and incidentals required to provide all valves and appurtenances as shown and specified.
 - c. Furnish standard spare parts for valves, actuators, and appurtenances along with any special tools required for standard maintenance and repair.
- B. Coordination: Review installation procedures under other Contracts and Sections and coordinate with the Work which is related to this Section including buried piping installation, exposed piping installation, insulation, plumbing, and chemical feed equipment.
- C. Related Work Specified Elsewhere:
 - 1. Section 150600, Support and Anchors
 - 2. Section 150650, Ductile Iron Piping & Fittings
 - 3. Section 150670, PVC Piping and Tubing
 - 4. Section 151090, Erecting and Jointing Interior Piping

1.2 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Valves and appurtenances provided under this Section shall be the standard product in regular production of the equipment furnished.
 - 2. Have a proven record of manufacturing quality products.
 - 3. Have a proven record of prompt responses to clients to troubleshoot maintenance and operation issues as well as routine maintenance services.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. AWWA C 504, Standard for Rubber-Seated Butterfly Valves.
 - 2. ASTM A48, Specification for Gray Iron Castings.
 - 3. ASTM A536, Specification for Ductile Iron Castings.
 - 4. ASTM D1784, Specification for Poly Vinyl Chloride (PVC) and CPVC Plastic Pipe, Schedules 40, 80, and 120.
 - 5. AGMA Standards.
 - 6. NEMA, National Electrical Manufacturers Association.

7. ANSI 21.11, Rubber Gasket Joints for Ductile Iron and Gray Iron pressure Pipe and Fittings.
 8. NSF/ANSI, specifically NSF/ANSI Standard 61, Annex G and NSF/ANSI Standard 372.
- C. Technical Services:
1. Provide a factory-trained manufacturer's representative to assist the Contractor with installation and field testing.
 - a. Installation: One day, one trip for valves and related products
 - b. Start-up and field testing: One day, one trip
 2. The Contractor shall coordinate the manufacturer representative's site visits with the Owner and Engineer.

1.3 SUBMITTALS

- A. Shop Drawings: In accordance with Section 013000, submit for approval detailed drawings, data and descriptive literature on all valves and appurtenances, which shall include, but not limited to:
1. Manufacturer's Specifications, catalog data, illustrations, wiring diagrams and other diagrams.
 2. Submit sizes, weights, capacities, anticipated loadings and fabrication details of all metal supports, be they hangers, brackets, struts, structural members, required for installation.
 3. Data regarding each valve and data for electric motor actuators.
 4. Shop drawing data for accessory items.
 5. Manufacturer's data as needed to supplement shop drawing data.
 6. Schematic drawings for electric power systems.
 7. Shop drawing submittals shall have a statement that the manufacturer's painted primer coat is compatible with the specified finished coat.
 8. List of standard spare parts to be furnished and quantities. Special tools required for maintenance and repair shall be included.
- B. Submit a manufacturer's affidavit stating that valves and related products furnished comply with all applicable provisions of the referenced standards and modifications thereto described herein.
- C. Operation and Maintenance Data: Submit detailed operation and maintenance data for all valves and appurtenances provided under this Section.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handle all valves and appurtenances very carefully. Valves that are cracked, dented or otherwise damaged or dropped will not be acceptable.
- B. Store all valves and appurtenances in approved enclosed shelter and off the ground, unless otherwise acceptable to Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. All valves shall have Manufacturer's name and working pressure cast in raised letters on valve body.
2. All manual valve operators shall open counter-clockwise. Valves shall indicate the direction of operation.
3. All bolts and studs embedded in concrete and stubs required for wall pipe shall be of stainless steel.
4. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.
5. Bolts and nuts shall have hexagon heads and nuts.
6. Gasket material and installation shall conform to Manufacturer's recommendations.

2.2 BUTTERFLY VALVES (3 INCH AND LARGER)

A. General:

1. Butterfly valves shall be of the tight closing rubber seat type.
2. Valves shall meet the full requirements of AWWA C 504 for Class 150B, except as modified herein.
3. Valves shall be NSF/ANSI 61 certified (specifically Annex G as well as NSF/ANSI 372).

B. Valve Body:

1. Valve bodies shall be constructed of ASTM A126, Class B cast or ductile iron.
2. Valve ends shall be flanged.
3. Two trunnions for shaft bearings shall be integral with each valve body.
4. Body thickness shall be in accordance with AWWA C504.

C. Valve Discs:

1. Valve discs shall rotate 90 degrees from full open position to a tight shut position.
2. Valve discs shall be constructed of ASTM A126, Class B cast or ductile iron with nickel-chromium edge.

D. Valve Shafts: Valve shafts shall be constructed of Type 304 stainless steel, ground smooth and polished and meet the requirements of AWWA C504 Class 150B.

E. Valve Seats:

1. Seats shall be suitable for indicating service. Seats shall be of molded, new natural or synthetic rubber.
2. Seats shall be mounted on the disc or in the body.
 - a. Seats Mounted on Disc:

- 1) Seats mounted on the disc shall be mechanically secured to the disc with stainless steel fasteners.
- 2) Rubber seat shall be reinforced with a stainless steel retaining ring.
- 3) Seats vulcanized or bonded to the disc are not acceptable.
- 4) Mating surfaces shall be Type 316 stainless steel and mechanically retained in the body and sealed with an O-ring.
- b. Seats Mounted in Body:
 - 1) Seats mounted in body shall be mechanically secured with stainless steel fasteners.
 - 2) Mating surfaces shall be Type 316 stainless steel or plasma applied nickel-chromium material containing 80 percent nickel and 20 percent chrome.
 - 3) Plated or sprayed on mating surface material is not acceptable.
3. Seat band shall withstand a minimum pull of 75 lbs per ASTM D429, Method B.
4. Seats shall be offset from shaft and shall be field replaceable for valves 24-in. in diameter and larger.
- F. Valve Bearings: Bearings shall be sleeve type, corrosion resistant and self-lubricated.
- G. Valve Operator: Electric motor actuated. Open-Close type, see Plans and Section 2.4/F/6 herein.
- H. Valves shall open counter-clockwise.
- I. Painting: Valve surfaces except for disc, seating and finished portions shall be evenly coated in accordance with AWWA C504.
- J. Manufacturers:
 1. Pratt Valve Company
 2. Mueller Company
 3. DeZurik, Inc.
 4. Val-Matic
 5. or approved equal.

2.3 NON-LUBRICATED ECCENTRIC PLUG VALVES

- A. Plug valves shall be the non-lubricated, eccentric, resilient type with an elastomer covering all seating surfaces. Plug valves shall be NSF 61 certified.
- B. Valve Body:
 1. Valve body shall be constructed of ASTM A536 Class 65-45-12 ductile iron.
 2. Ports shall be square and shall not be less than 80 percent of the area.

3. Ends: Flanged ends shall be faced and drilled per ANSI B16.1, Class 125/150.
- C. Plugs:
1. Plug shall be of one piece solid construction.
 2. Plug shall have resilient elastomer facing.
 3. Plug shall have PTFE thrust bearings on the upper and lower bearing journals to reduce torque and to prevent dirt and grit from entering the bearing and seal area.
- D. Valve Bearings:
1. Valves shall be furnished with replaceable bearings conforming to AWWA C517.
 2. Valve bearings shall be sleeve-type, corrosion resistant, and self-lubricated.
- E. Valve Seats and Seals:
1. Valve seating surfaces shall be Neoprene or Buna-N synthetic rubber.
 2. Valve shall be furnished with a welded in nickel overlay seat of not less than 90 percent nickel. Sprayed, plated, or screwed-in seats are not acceptable.
 3. Stem seals shall be replaceable without valve disassembly or without removing the valve from the line.
- F. Electric Motor Actuators: Modulating type, see Plans and Section 2.4/F/7 herein.
- G. Pressure Rating:
1. Valves shall be designed and manufactured to seal bubble tight at 150 psi.
 2. Each valves shall be hydrostatically and seat tested. Certified test results shall be furnished as evidence of proof-of-design.
- H. Manufacturers:
1. GA Industries
 2. DeZurik
 3. Milliken Valve Company, Inc.
 4. Val-Matic
 5. or approved equal.

2.4 ELECTRIC MOTOR ACTUATORS (BUTTERFLY VALVES)

- A. General:
1. Electric motor actuators shall be capable of fully opening under the maximum hydraulic head and shall conform to the requirements of AWWA C540.
 2. The actuators shall be designed for indoor or outdoor service, operating in an ambient temperature of -20 to +175°F.
 3. The actuators shall be capable of being mounted in any position.
 4. The actuators shall include motor, power gearing travel limit switches, torque limit switches, handwheel, terminals for motor power and control, and a separable worm gear operator.

5. Electric valve actuators shall be quarter turn actuators and shall fully open or close the valve in 60 seconds.
- B. Enclosure and Housing:
1. Actuators shall be O-ring sealed, watertight to NEMA 4, and shall have an inner watertight and dust proof O-ring seal between the terminal compartment and the internal electric elements of the actuator fully protecting the motors and all other internal electrical elements of the actuator from the ingress of moisture and dust when the terminal cover is removed.
 2. The terminal compartment and limit switch compartment covers shall be fastened to the gear housing by stainless steel belts.
 3. The gear housing and all load-bearing enclosures shall be constructed of cast iron. Non-load bearing enclosures and covers shall be constructed of aluminum, cast iron, or steel.
- C. Gearing:
1. All power gearing shall be constructed of hardened steel or bronze and shall be permanently lubricated with grease.
 2. The drive nut shall be separable from the gear assembly to facilitate mounting of the actuator onto the valve.
 3. The drive nut shall also be splined to allow actuator mounting on the valve at ninety degree intervals so that the valve/actuator combination may be positioned and interference from adjacent equipment may be minimized.
 4. Quarter turn actuators shall be furnished with mechanical stops to restrict the valve disc from passing through the seat. The stops shall be adjustable from 80 to 120 degrees so that accurate seating can be achieved.
 5. All limit switch gearing and feedback potentiometer reduction gearing shall be adequately lubricated and shall be made of steel or bronze.
- D. Motor:
1. The drive motor shall be designed for actuator service and shall have high starting torque, low stall torque, and low inertia.
 2. The motor shall be capable of starting against its rated load in either open or closed direction when the voltage to the motor terminals is plus or minus ten percent of the rating.
 3. The motor shall be of induction type with Class F, tropicalized insulation. Three terminal switches shall be embedded 120 electrical degrees apart in the motor windings to ensure safe shut-down in the event of excess current draw.
 4. The motor housing shall be capable of operation in any position. It shall be properly sealed from the grease-filled gear case. Removal of the motor shall not result in loss of lubricant.
- E. Limit Switches:
1. Travel limit switches shall be provided to de-energize the motor control circuit when the actuator reaches the limit of travel in either the open or closed directions.

2. The limit switch drive shall be of the counter-gear type and shall be “in step” with the actuator output drive at all times in either the automatic or manual mode of operation.
3. Two normally open and two normally closed contacts shall be supplied and placed at each end of the travel path. All contacts shall be completely sealed in a NEMA 4 enclosure.
4. Limit switches shall be fully and safely adjustable while power is supplied to the actuator. Switches shall be capable of limit adjustment with no more than five full turns of the limit switch adjustment spindle.

F. Appurtenances:

1. Handwheel:
 - a. A handwheel shall be permanently attached to the actuator for manual operation. The handwheel shall be engaged by a positive declutch mechanism and shall automatically disengage when the motor is in operation.
 - b. A fused or inoperable motor shall not prevent manual operations. Motor operation shall always take precedence over the manual operation.
2. Torque Switches:
 - a. Torque limit switches shall be provided to de-energize the motor control circuit when the valve encounters and obstruction during travel. Each actuator shall have an open direction torque switch and a close direction torque switch.
 - b. The torque switches shall be mechanically operated and able to be set in torque units. Torque switches shall be calibrated prior to the actuator’s assembly to the valve.
 - c. Torque switches shall be adequately rated to carry the control current. The contacts shall be completely sealed.
3. Heater: An adequately sized space heater shall be installed in the limit switch compartment to aid in the prevention of damage resulting from condensation.
4. Mechanical Dial Position Indicator:
 - a. The dial indicator shall be furnished to continuously indicate the position of the valve at and between the fully open and fully closed positions.
 - b. The indicator shall operate when the actuator is in either the electrical mode or manual mode.
5. Electrical Terminal Housing:
 - a. The electrical terminals shall be housed in a compartment isolated from the limit switch/torque switch compartment.
 - b. All control and motor power terminations shall be to plug and socket assembly in order that removal of the terminal compartment cover simultaneously disconnects all wiring with the actuator.
 - c. A quantity of two – ¾ inch NPT conduit entries shall be furnished. A double sealed terminal compartment shall be provided for watertight seal between the terminal compartment and the balance of the actuator components.

6. Controls (Open/Close Service):
 - a. Motor controls shall consist of solid-state reversing contactors to reverse motor direction (transformer for control power, phase discriminator trip or terminal switch trip). Selection of operation from local-off-remote” selector switch. Remote signals shall be accepted by the actuator through optical isolators or interposing relays.
 - b. Operation of actuator will be by open-stop-close pushbuttons with red lamp indicating closed and green lamp indicating open.
7. Controls (Modulatory Service)
 - a. Actuators in modulating service will be selected such that the required dynamic valve torque is no more than 60% of the electric actuator’s maximum rated breakaway of torque. Power gearing in modulating actuators shall have zero backlash between the motor and actuator point.
 - b. All actuators in modulating service will be furnished with a feedback, potentiometer. The positioner shall be capable of accepting a 4-20 mA DC command signal and positioning the valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer mounted inside the actuator. The positioner shall be field adjustable to fail to the “open”, “closed”, or “last” position on loss of 4-20 mA DC command signal.
 - c. Positioner accuracy shall be equal to or better than +/-0.5 percent of full range.
 - d. Actuators to be rated at 1,200 modulations per hour.
 - e. Motor controls shall consist of solid-state reversing contactors to reverse motor direction (transformer for control power). Selection of operation from local or remote source shall be by “local-off-remote” selector switch. Remote signals shall be accepted by the actuator through optical isolators or interposing relays.
 - f. Operation of actuator will be by open-stop-close pushbuttons with red lamp indicating closed and green lamp indicating open.

G. Controls:

1. Motor controls shall be furnished in NEMA 4 enclosure as an integral part of the actuator.
2. Motor controls shall consist of mechanical reversing contactors to reverse direction of motor rotation.
3. Contractor shall coordinate with Owner’s representative for the control schemes to integrate the valves actuators and programming requirements.

H. Manufacturers:

1. Auma Actuators, Inc.
2. or approved equal.

2.5 BALL VALVES (NON-METALLIC)

- A. Materials:
 - 1. Body: PVC: ASTM D1784, Type 4, Grade 1.
 - 2. Ball: Same material as valve body.
 - 3. Seats: Teflon, concave design to absorb expansion.
 - a. Triangular seat design is not acceptable.
 - b. Provide Viton or EPDM back up cushions to absorb expansion.
 - 4. Seals: Viton
 - 5. Viton: All Viton shall contain a minimum of 55% Viton.
- B. Ends: Socket ends. Weld piping with solvent cement with low-VOC and suitable for use in sodium hypochlorite (< 15%) applications.
- C. Pressure Rating: 150 psi
- D. Actuator Type: Lever with retainer screw
- E. Manufacturers:
 - 1. ASAH/ America Inc.
 - 2. NIBCO/Chemtrol Inc.
 - 3. Hayward Industrial Products, Inc.
 - 4. or approved equal.

2.6 MECHANICAL COUPLINGS

- A. Steel mechanical couplings of the gasketed, sleeve type shall be furnished and installed where shown on the drawings. The couplings shall be of the proper diameter to fit ductile iron pipe and make a tight joint. The coupling shall not have stops. All couplings shall be for 150 psi working pressure and shall meet AWWA C210.
- B. Each coupling shall consist of one middle ring of a thickness and length suitable for the application and test pressures; two followers; two rubber compound wedge section gaskets and sufficient trackhead bolts to properly compress the gaskets.
- C. Each coupling shall be painted inside and outside with a NSF61 approved epoxy paint per AWWA C210.
- D. Couplings:
 - 1. Transition couplings shall be for connecting plain end ductile iron pipe to machined-end asbestos-cement pipe shall have the pipe stop removed.
 - 2. No anchor bolts or anchor pins required.
 - 3. Contractor to field verify the outside diameter of the asbestos-cement pipe prior to ordering coupling.

- E. Manufacturers:
 - 1. Couplings for ductile iron shall be Style 38 as manufactured by Dresser Industries, Style 411 as manufactured by Smith-Blair, Baker Series 200, or approved equal. Couplings shall have the pipe stopped removed.
 - 2. Flanged adapters for ductile iron shall be Style 128 as manufactured by Dresser Industries; Style 912 as manufactured by Smith-Blair, Baker Series 602, or approved equal.
 - 3. Transition couplings shall be Dresser Industries Style 153, Smith-Blair Style 413, Baker Series 220-23.30-21.60 or approved equal. Couplings shall have the pipe stop removed.

2.7 CORPORATION STOPS

- A. Corporation stops shall be bronze, with an AWWA tapered thread inlet and a NPT threaded outlet. Corporation stops shall be NSF/ANSI 61 certified (specifically Annex G as well as NSF/ANSI 372).
- B. Corporation stops may be the ball valve type.
- C. Corporation stops shall be as manufactured by:
 - 1. Mueller Company
 - 2. Ford Meter Box Company
 - 3. or approved equal

2.8 MISCELLANEOUS PIPING

- A. Copper Tubing:
 - 1. If not otherwise indicated or specified, copper tubing for use inside of buildings shall be Type "L", hard drawn.
 - 2. Copper tubing shall be Type "K" for tubing connected to valves and equipment. All copper tubing in the new powdered activated carbon (PAC) room in the Chemical Building shall be Type "K".
 - 3. All copper tubing shall conform to the requirements of ASTM B88.
 - 4. All changes in direction shall be made with fittings. Fittings shall be wrought bronze or wrought copper of the solder-joint type conforming to ASTM B61. Unions shall be cast bronze with ground seats and solder joints.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fort Thomas Diversion Piping: This work will be bid as an add alternative bid item and shall be performed only if authorized by the Owner to include the project.
- B. Install all valves, equipment, and appurtenances in accordance with Manufacturer's recommendations.

- C. Install all valves, equipment, and appurtenances plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment or other causes.
- D. Install all valves so that operating handwheels or wrenches may be conveniently turned free from floor, but without interfering with access.

3.2 POWER AND SIGNAL

- A. Valves:
 - 1. Power: Refer to plans and specifications for electrical requirements and sources of power.
 - 2. Signal:
 - a. Refer to plans for additional information and clarification for Contractor work and responsibilities.
 - b. Contractor shall furnish and install conduit and wiring for signal work.
 - c. Coordinate with Owner representative for requirements and integration of valves into plant SCADA systems.

3.3 FIELD TESTS AND ADJUSTMENTS

- A. Adjust all parts and components as required to provide correct operation.
- B. Conduct functional field test of each valve in presence of Owner and Engineer to demonstrate that each part and all components together function correctly.

* * END OF SECTION * *

SECTION 151090

ERECTING AND JOINTING INTERIOR PIPING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing of supports and hangers and installation of all interior and exposed exterior piping and supports.
 - 1. Furnish, support, hang and install piping of the materials, coatings and linings shown or specified at locations as specified or where shown.
 - 2. Interior piping includes valves, actuators, miscellaneous pipe fittings, flow meters, and chemical feed connections. These items, although not necessarily part of the pipe run, may require independent anchoring or support for access and removal of pipe or system components.
- B. Related work specified in other sections includes:
 - 1. Section 150600 – Supports and Anchors
 - 2. Section 150650 – Ductile Iron Pipe and Fittings
 - 3. Section 150670 – PVC Piping and Tubing
 - 4. Section 151000 – Valves, Specials, and Appurtenances

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1.
 - 1. Take extreme care in loading and unloading the pipe and fittings. Do the work slowly using skids or suitable power equipment, and keep the pipe under control at all times.
 - 2. Handling Procedures: Under no condition is the pipe to be dropped, bumped, dragged, pushed or moved in any way which will cause damage to the pipe, lining or coating.
 - 3. Use of Slings: When handling the pipe with a crane, use a suitable pipe hook or sling around the pipe. Under no condition is the sling to be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends, lining and coating.
 - 4. Damage: If any piping or fittings are damaged in the process of delivery, storing, handling or laying replace or repair such piping or fittings as approved.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide hangers and supports and all necessary appurtenances as specified in Section 150600.
- B. Common figure numbers and styles for pipe hangers and supports.
- C. Fabricated or vendor-supplied brackets, mounting flanges, offsets, and braces, of steel or cast iron construction.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Install all piping in accordance with the manufacturer's recommendations, the Contract Documents, and approved submittals.
 - 1. Install piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
 - 2. Install rigid piping free of sags or bends.
 - 3. Place pipe runs to minimize obstruction to other work.
 - 4. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
 - 5. Do not penetrate building structural members.
 - 6. Locate groups of piping parallel to each other and at common elevations whenever practical, spaced to permit applying insulation and servicing of valves.
 - 7. Fit and install pipelines in a neat and workmanlike manner in accordance with approved shop drawings.
 - 8. Pipe supports and anchors are not shown in complete fashion. Additional supports other than those shown on drawings may be required and shall be furnished and installed at no additional cost to the Owner.
- B. Flanged Joints: Make flanged joints with bolts or bolt studs with a nut on each end.
 - 1. Flanged to Flange Assembly: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by bolt manufacturer.

- C. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the coupling to bring the gaskets up evenly all around the pipe.
 - 1. Torque Wrenches: Do final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.
- D. Welding: Comply welding of pipe joints with the requirements of ANSI B31.1 unless otherwise specified. Do all off-site welding of steel pipe conforming to the appropriate requirements.
 - 1. Procedures: Confirm that pipe and fittings with wall thickness of 3/16 inch and larger have ends beveled for welding, and that the parts to be welded are securely held in place and are in proper alignment during welding.
 - a. Separate the abutting pipe ends before welding to permit complete fusion to the inside wall of the pipe without overlapping.
 - b. Provide welding continuous around the joint and completed without interruption.
 - c. Provide welds of the single vee butt type, of sound weld metal thoroughly fused into the ends of the pipe and into the bottom of the vee.
 - d. Provide welds free from cold shuts, pinholes, oxide inclusions or other defects.
- E. Anchors and Stands: Furnish and install anchors and stands when specified, shown, or required for holding the pipelines and equipment in position or alignment.
 - 1. Small Piping Supports: Where adjustable supporting devices are not required, support pipelines 3 inches in diameter and smaller on cast-iron, malleable iron, or steel hooks, hook plates, rings or ring plates.
 - 2. Metering Pump and Chemical Dilution Piping: Drawings show desired alignment and features of piping system components. CONTRACTOR shall install these piping systems on a framed support system, such as Uni-Strut.
 - 3. Valve Actuators: In many instances, a valve actuator may be heavier or larger than the valve it powers. The actuator shall be supported separate from the valve such that the disassembly of valve and actuator can be accomplished while each is supported in aligned position.
- F. Hangers and Supports
 - 1. Direction Changes: Provide pipe hangers at each change in pipe direction, on both sides of pipe mounted valves and equipment and on both sides of pipe loops and expansion absorbing devices.
 - 2. Brackets: Use brackets for the support of piping from vertical surfaces.
 - 3. Anchors: Furnish and install anchors when specified, shown or required for holding the pipelines and equipment in position or alignment.
 - 4. Inserts: Install galvanized inserts in concrete structures where required for fastening supporting devices.

5. Controlled Movements: Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
6. Load Distribution: Adjust hangers to distribute loads equally on the attachment and to achieve any indicated slope of the pipe.

3.2 FIELD QUALITY CONTROL

- A. Disinfect piping and perform testing as indicated within Specification Sections 150650 and 150670.

3.3 CLEANING

- A. General: Clean the interior of pipelines of all dirt and superfluous material of every description in an approved manner.

****END OF SECTION****

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.
 - 5. Explosion proof.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.

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- D. Rotor: Random-wound, squirrel cage.
- E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- F. Temperature Rise: Match insulation rating.
- G. Code Letter Designation:
 - 1. Motors 1/6 HP and Larger: NEMA starting Code F or Code G.
- H. Enclosure Material: Cast iron for motor frame sizes **324T** and larger; rolled steel for motor frame sizes smaller than **324T**.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
 - 1. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment supports.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following: include Product Data for components:
 - 1. Equipment supports.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 1. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

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2.3 MATERIALS

- A. Aluminum: ASTM B221.
- B. Carbon Steel: ASTM A1011/A1011M.
- C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A240/A240M.
- E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi , 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- B. 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**.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for **equipment supports**.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

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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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to **1-1/2 inches**.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- D. Use carbon-steel **metal framing systems** and attachments for general service applications.
- E. Use **corrosion-resistant** attachments for hostile environment applications.
- F. Use padded hangers for piping that is subject to scratching.

END OF SECTION 230529

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Testing, Adjusting, and Balancing of Air Systems:
 - a. Constant-volume air systems.
2. Testing, adjusting, and balancing of equipment.
3. Testing, adjusting, and balancing of existing HVAC systems and equipment.
4. Procedures for exhaust hoods.
5. Duct leakage tests verification.
6. HVAC-control system verification.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.
- G. UFAD: Underfloor air distribution.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within **30** days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within **30** days of Contractor's Notice to Proceed, submit the Contract Documents review report, as specified in Part 3.
- C. Strategies and Procedures Plan: Within **30** days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures, as specified in "Preparation" Article.

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- D. System Readiness Checklists: Within **30** days of Contractor's Notice to Proceed, submit system readiness checklists, as specified in "Preparation" Article.
- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.4 QUALITY ASSURANCE

- A. TAB Specialists Qualifications, Certified by AABC:
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC.
- B. TAB Specialists Qualifications, Certified by **NEBB or TABB**:
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by **NEBB or TABB**.
 - 2. TAB Technician: Employee of the TAB specialist and certified by **NEBB or TABB**.
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."
- D. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.5 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

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PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine the approved submittals for HVAC systems and equipment.
- C. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- D. Examine equipment performance data, including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- E. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- F. Examine test reports specified in individual system and equipment Sections.
- G. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- H. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainer baskets are installed and clean.
- I. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine system pumps to ensure absence of entrained air in the suction piping.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.

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- N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Fans are operating, free of vibration, and rotating in correct direction.
 - d. Automatic temperature-control systems are operational.
 - e. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system in accordance with the procedures contained in **AABC's "National Standards for Total System Balance"** and in this Section.
- B. Cut insulation, ducts, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Where holes for probes are required in piping or hydronic equipment, install pressure and temperature test plugs to seal systems.
 - 4. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in **inch-pound (IP)** units.

3.4 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

- A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to, the following:
 - 1. Motors.
 - 2. Fans and ventilators.
 - 3. Coils.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' Record drawings duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
 - c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

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2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 3. Review Contractor-prepared shop drawings and Record drawings to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 4. Obtain approval from **Owner** for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.

3.7 PROCEDURES FOR EXHAUST HOODS

- A. Room Pressure: Measure and record room pressure with respect to atmosphere and adjacent space with hoods in room initially not operating and then with hoods operating.

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- B. Makeup Air: Systems supplying source of makeup air to hoods shall be in operation during testing and balancing of exhaust hoods.
 - 1. Measure and record temperature of makeup air entering hood. If hood makeup air is from multiple sources having different temperatures, measure and record the airflow and temperatures of each source and calculate the weighted average temperature.
 - 2. Use simulated smoke to observe supply air-distribution air patterns in vicinity of hoods. Consult with hood manufacturer and report conditions that have a detrimental effect on intended capture, containment, and other attributes effecting proper operation.
- C. Rooms with Multiple Hoods: Test each hood separately, one at a time, and repeat tests with all hoods intended to operate simultaneously by design.
- D. Canopy Hoods: Measure and record the following:
 - 1. Pressure drop across hood.
 - 2. Airflow by duct traverse where duct distribution will allow accurate measurement, and calculate hood average face velocity.
 - 3. Measure velocity across hood face and calculate hood airflow.
 - a. Clearly indicate the direction of flow at each point of measurement.
 - b. Measure velocity across opening on not less than **12-inch** centers. Record velocity at each measurement, and calculate average velocity.
 - 4. Capture and Containment: Check each hood for proper capture and containment using a smoke-emitting device. Observe and report performance. Make adjustments to achieve optimum results.

3.8 DUCT LEAKAGE TESTS

- A. Witness the duct leakage testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified limits.
- C. Report deficiencies observed.

3.9 HVAC CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
 - 1. Verify HVAC control system is operating within the design limitations.
 - 2. Confirm that the sequences of operation are in compliance with Contract Documents.
 - 3. Verify that controllers are calibrated and function as intended.
 - 4. Verify that controller set points are as indicated.
 - 5. Verify the operation of lockout or interlock systems.
 - 6. Verify the operation of valve and damper actuators.
 - 7. Verify that controlled devices are properly installed and connected to correct controller.
 - 8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.

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9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.10 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Exhaust Fans **Plus or minus 10 percent** If design value is less than 100 cfm, within 10 cfm .

- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.11 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for system-balancing devices. Recommend changes and additions to system-balancing devices, to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance-measuring and -balancing devices.

- B. Status Reports: Prepare **weekly** progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

- B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

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- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents, including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans performance forms, including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Fan drive settings, including settings and percentage of maximum pitch diameter.
 - c. Other system operating conditions that affect performance.
 16. Test conditions for pump performance forms, including the following:
 - a. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of exhaust airflows.

3.13 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of **Owner**.
- B. **Owner** shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to the lesser of either **10** percent of the total measurements recorded or the extent of measurements that can be accomplished in **a normal 8-hour business day**.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

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- D. If the number of "FAILED" measurements is greater than **10** percent of the total measurements checked during the final inspection, the TAB shall be considered incomplete and shall be rejected.
- E. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. All changes shall be tracked to show changes made to previous report.
 - 2. If the second final inspection also fails, Owner may pursue others Contract options to complete TAB work.
- F. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

- A. Within **90** days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230923.12 - CONTROL DAMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular control dampers with airfoil blades.
2. Electric and electronic control-damper actuators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of damper and actuator:

B. Delegated Design Submittals:

1. Schedule and design calculations for control dampers and actuators, including the following:
 - a. Unique designation for each damper/actuator assembly.
 - b. Service/application.
 - c. Damper assembly size.
 - d. Damper assembly weight, including actuator(s).
 - e. Damper and actuator action (modulating or two position).
 - f. Flow at project design and minimum flow conditions.
 - g. Face velocity at project design and minimum airflow conditions.
 - h. Pressure drop across damper at project design and minimum airflow conditions.
 - i. AMCA 500D damper installation arrangement used to calculate and schedule pressure drop, as applicable to installation.
 - j. Maximum close-off pressure.
 - k. Leakage airflow at maximum system pressure differential (fan close-off pressure).
 - l. Damper torque required at worst-case condition for sizing actuator.
 - m. Actuator selection indicating torque provided.
 - n. Actuator fail-safe position on loss of power and loss of signal.
 - o. Remarks listing special requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are indicated and coordinated with each other, using input from installers of the items involved:

1. Product installation location indicated in relationship to room, duct, and equipment.
2. Size and location of wall access panels for control dampers and actuators installed behind walls.

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3. Size and location of ceiling access panels for control dampers and actuators installed above inaccessible ceilings.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For control dampers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE 62.1 Compliance: Applicable outdoor ventilation requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. Code Compliance: Comply with governing energy code.
- E. Ground Fault: Properly ground products to prevent failing due to ground fault conditions.
- F. Backup Power Source: Serve control-damper actuators from a backup power source where associated with systems and equipment served by a backup power source.
- G. Environmental Conditions: For actuators not available with integral enclosures complying with requirements indicated, house in protective secondary enclosures complying with requirements.
 1. Fail-Safe Positions: closed.
 - a. Outdoor Air: **Close.**
 - b. Mixed Air: **Closed.**
 2. Select dampers with smooth and stable operation throughout full range of operation over varying pressures and temperatures encountered.
 3. Sizing: **See Drawings**

2.2 RECTANGULAR CONTROL DAMPERS WITH AIRFOIL BLADES

- A. General Requirements:
 1. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.

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- a. Include multisection damper assemblies with intermediate reinforcing where required between individual sections being joined together. Construct reinforcing of same material (aluminum, galvanized steel, stainless steel) as damper frame.
 2. Factory install actuator(s) as integral part of damper assembly. Coordinate, with damper manufacturer, field requirements for actuators, such as type, fail-safe position, power supply, location, and mounting requirements.
- B. Rectangular Control Dampers with Aluminum Airfoil Blades and Frames:
1. Manufacturers: Subject to compliance with requirements, **provide products by the following:**
 - a. American Warming and Ventilating (AWV); Mestek, Inc.
 - b. Arrow United Industries; Mestek, Inc.
 - c. Greenheck Fan Corporation.
 - d. Johnson Controls, Inc.
 - e. Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.
 - f. TAMCO (T. A. Morrison & Co. Inc.).
 2. **AMCA Certification: Test, rate, and seal, in accordance with AMCA 511 for air performance and air leakage.**
 3. Performance:
 - a. Leakage:
 - 1) AMCA 511, Class 1A, at 1 in. wg differential static pressure: Leakage not to exceed 3 cfm/sq. ft. against 1 in. wg differential static pressure when tested in accordance with AMCA 500D.
 - 2) AMCA 511, Class 1, at 4 in. wg differential static pressure: Leakage not to exceed 8 cfm/sq. ft. against 4 in. wg differential static pressure when tested in accordance with AMCA 500D.
 - b. Pressure Drop: **0.05 in. wg** at **1500 fpm** across a **24-by-24-inch** damper when tested in accordance with AMCA 500D, figure 5.3.
 4. Construction:
 - a. Frame:
 - 1) Material: ASTM B211/B211M, Alloy 6063 T5 extruded-aluminum profiles, minimum **0.125 inch** thick.
 - 2) Arrangement: Hat-shaped channel with integral extended face flange(s) having mating face of minimum **1 inch** for attachment to duct flanges, plenum walls, and equipment.
 - 3) Width: Not less than **5 inches**.
 - b. Blades:
 - 1) Configuration: Parallel or opposed blade configuration as required by application.

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- 2) Material: ASTM B211/B211M, Alloy 6063 T5 extruded-aluminum profiles, **0.07 inch** thick.
 - 3) Shape: Hollow, airfoil.
 - 4) Length: As required by close-off pressure rating, not to exceed **48 inches**.
 - 5) Width: Not to exceed **6 inches**.
- c. Seals:
- 1) Blades: Replaceable; extruded Santoprene, silicone, **or damper manufacturer-offered equivalent**, as required by performance requirements. Seals are mechanically attached in extruded blade slots.
 - 2) Jambs: Replaceable; stainless steel, compression type **or mechanically attached extruded silicone**.
- d. Axles:
- 1) Diameter: Minimum **0.375 inch**.
 - 2) Material: **Aluminum**.
 - 3) Mechanically attached to blades.
- e. Bearings:
- 1) Material: Molded stainless steel sleeve, as required by operating conditions, mounted in frame.
 - 2) Where blade axles are installed in vertical position, provide thrust bearings.
- f. Linkage:
- 1) Hardware: **Plated or stainless steel**.
 - 2) Material: **Aluminum, plated steel**
 - 3) Mounting: Concealed in frame.
- g. Transitions with Sleeve:
- 1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connections.
 - 2) Factory mount damper in a sleeve with a close transition to mate to field connection.
 - a) Sleeve length not less than **12 inches** for dampers without jackshafts and not less than **16 inches** for dampers with jackshafts.
 - b) Oversize damper and sleeve for duct connection size plus minimum **4 inches (100 mm)**.
 - 3) Fabricate sleeve and transitions of materials (aluminum, galvanized steel or stainless steel) to match damper frame **or adjoining duct**.
 - 4) Match end connections (flange or sleeve) to field connections.
- h. Additional Corrosion Protection for Corrosive Environments:

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- 1) Provide anodized finish, minimum of 0.0007 inch thick, for aluminum surfaces in contact with airstream.
- 2) Paint surfaces exposed to airstream with an **enamel or epoxy** finish. Prepare surfaces to be painted according to paint manufacturer's instructions.
- 3) Construct axles, damper linkage, and hardware of Type 316L stainless steel.

2.3 GENERAL CONTROL-DAMPER ACTUATORS REQUIREMENTS

- A. Select actuators to operate related damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.
- B. Select actuators with sufficient power and torque to close off against the maximum system pressures encountered. Actuators are to be sized to close off against the fan shutoff pressure as a minimum requirement.
- C. The total damper area operated by an actuator is not to exceed 80 percent of manufacturer's maximum area rating.
- D. Provide one actuator for each damper assembly where possible. Operate multiple actuators required to drive a single damper assembly in unison.
- E. Avoid the use of excessively oversized actuators, which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.
- F. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.
- G. Provide mounting hardware and linkages for connecting actuator to damper.
- H. Select actuators to fail in desired position in the event of a power **and signal** failure.
- I. Actuator Fail-Safe Positions: **As indicated below:**
 1. Outdoor Air: **Close.**

2.4 ELECTRIC AND ELECTRONIC CONTROL-DAMPER ACTUATORS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
 1. Belimo Aircontrols (USA), Inc.
 2. Honeywell Building Solutions; Honeywell International, Inc.
 3. Johnson Controls, Inc.
 4. Schneider Electric USA, Inc.
 5. Siemens Industry, Inc., Building Technologies Division.
- B. Type: Motor operated, with or without gears, electric and electronic.

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C. Voltage:

1. **Voltage selection is delegated to professional designing control system 24 V.**
2. Actuator to deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
3. Actuator to function properly within a range of 85 to 120 percent of nameplate voltage.

D. Construction:

1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed-steel enclosures.
2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains are to be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

E. Local Field Adjustment: Make spring-return actuators easily switchable from fail-safe open to fail-safe closed in the field without replacement.

F. Local Manual Override: Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

G. Two-Position Actuators: Single direction, spring return or reversing type.

H. Modulating Actuators:

1. Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:
 - a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
 - b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for **0 to 10** signals.
 - c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to a pulse duration (length) of signal from a dry-contact closure, triac sink, or source controller.
 - d. Programmable Multifunction:
 - 1) Control input, position feedback, and running time are to be factory or field programmable.
 - 2) Diagnostic feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
 - 3) Service data, including at a minimum, number of hours powered and number of hours in motion.

PART 3 - EXECUTION

3.1 CONTROL-DAMPER APPLICATIONS

- A. Select from damper types indicated to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.
- B. Rectangular Control-Damper Applications:
 - 1. Outdoor Air: **Rectangular dampers with aluminum airfoil blades** maximum air pressure and maximum air velocity.

3.2 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy most stringent requirements indicated.
- B. Properly support dampers and actuators, tubing, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a seismic, wind, or others forces common to the application.
- C. Provide wall openings, **and sleeves** required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.
- D. Seal penetrations made in fire-rated and acoustically rated assemblies.
- E. Fastening Hardware:
 - 1. Wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
 - 2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
 - 3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.
- F. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.
- G. Corrosive Environments:
 - 1. Use products that are suitable for environment to which they will be subjected.
 - 2. If possible, avoid or limit use of materials in corrosive environments, including, but not limited to, the following:
 - a. Process exhaust airstreams.
 - 3. Use Type 316 stainless steel tubing and fittings when in contact with a corrosive environment.

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4. When conduit is in contact with a corrosive environment, use Type 316 stainless steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
5. Where actuators are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 CONTROL DAMPERS

- A. Install smooth transitions, not exceeding **15** degrees, to dampers larger or smaller than adjacent duct. Install transitions as close to damper as possible but at distance to avoid interference and impact to performance. Consult manufacturer for recommended clearance.
- B. Clearance:
 1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
 2. Install dampers with at least **24 inches** of clear space on sides of dampers requiring service access unless more space is recommended by manufacturer. Provide code required clearances as applicable.
- C. Service Access:
 1. Install dampers and actuators to be accessible for visual inspection and service.
 2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator. Comply with requirements in Section 233300 "Air Duct Accessories."
- D. Install dampers straight and true, level in all planes, and square in all dimensions.
- E. Install supplementary structural reinforcement for large multiple-section dampers if factory-furnished support alone cannot handle loading.
- F. Attach field-installed actuator(s) to damper drive shaft.
- G. For duct-mounted and equipment-mounted dampers installed outside of equipment, install a visible and accessible indication of damper position from outside.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing is to have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install engraved phenolic nameplate with damper identification on damper.

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3.5 ELECTRICAL CONNECTIONS

- A. Install electrical power to field-mounted control devices requiring electrical power.
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260523 "Control-Voltage Electrical Power Cables."
- C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems."
- E. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."
- F. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.6 CONTROL CONNECTIONS

- A. Install control signal wiring to field-mounted control devices.

3.7 CLEANING

- A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed surfaces.

3.8 STARTUP

- A. Control-Damper Checkout:
 - 1. Check installed products before continuity tests, leak tests, and calibration.
 - 2. Check dampers for proper location and accessibility.
 - 3. Verify that control dampers are installed correctly for flow direction.
 - 4. Verify that proper blade alignment, either parallel or opposed, has been provided.
 - 5. Verify that damper frame attachment is properly secured and sealed.
 - 6. Verify that damper actuator and damper linkage attachment are secure.
 - 7. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
 - 8. Verify that damper blade travel is smooth and unobstructed throughout operating range.

3.9 ADJUSTMENT, CALIBRATION, AND TESTING:

- A. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.
- B. Check and document open and close cycle times for applications with a cycle time of less than **30** seconds.

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- C. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.12

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Hangers and supports.

1.2 ACTION SUBMITTALS

A. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top **and bottom** of ducts.
5. Dimensions of **main** duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.

B. Delegated Design Submittals:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- ##### A. Delegated Duct Design:
- Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
 - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
 - 2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible. **All longitudinal seams are to be Pittsburgh lock seams unless otherwise specified for specific application.**
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials are to be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
 - 1. Galvanized Coating Designation: **G60**.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Factory- or Shop-Applied Antimicrobial Coating:
 - 1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating is to be applied to the exterior surface.
 - 2. Antimicrobial compound is to be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

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3. Coating containing the antimicrobial compound is to have a hardness of 2H, minimum, when tested in accordance with ASTM D3363.
 4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
 5. Shop-Applied Coating Color: **White**.
 6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.
- D. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.4 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
- D. Steel Cables for Stainless Steel Ducts: Stainless steel complying with ASTM A492.
- E. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless Steel Ducts: Stainless steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations.

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Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

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3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR TYPE 1 COMMERCIAL
KITCHEN GREASE HOOD EXHAUST DUCT

- A. Install all ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- B. All ducts exposed to view are to be constructed of stainless steel as per "Duct Schedule" Article. All ducts concealed from view are to be **stainless** steel as per "Duct Schedule" Article.
- C. All joints are to be welded and are to be telescoping, bell, or flange joint as per NFPA 96.

3.4 ADDITIONAL INSTALLATION REQUIREMENTS FOR EXHAUST DUCTS SERVING
COMMERCIAL DISHWASHERS AND OTHER HIGH-HUMIDITY LOCATIONS

- A. Install dishwasher exhaust ducts and other exhaust ducts from wet, high-humidity locations without dips and traps that may hold water. Slope ducts a minimum of 2 percent back to dishwasher or toward drain.
- B. Provide a drain pocket at each low point and at the base of each riser with a 1-inch trapped copper drain from each drain pocket to open site floor drain.
- C. Minimize number of transverse seams.
- D. Do not locate longitudinal seams on bottom of duct.

3.5 ADDITIONAL INSTALLATION REQUIREMENTS FOR LABORATORY EXHAUST AND
FUME HOOD EXHAUST DUCTS

- A. Install ducts in accordance with NFPA 45, "Fire Protection for Laboratories Using Chemicals."
- B. Install exhaust ducts without dips and traps that may hold water. Slope ducts a minimum of 2 percent back to hood or inlet. Where indicated on Drawings, install trapped drain piping.
- C. Connect duct to fan, fume hood, and other equipment indicated on Drawings.

3.6 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 3. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.

4. Conditioned Space, Exhaust Ducts: Seal Class B.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet .
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.8 DUCTWORK CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 2. Test the following systems:

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- a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - b. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than **50** percent of total installed duct area for each designated pressure class.
 - c. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than **50** percent of total installed duct area for each designated pressure class.
 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 4. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
 5. Test for leaks before applying external insulation.
 6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 7. Give **seven** days' advance notice for testing.
- C. Duct System Cleanliness Tests:
1. Visually inspect duct system to ensure that no visible contaminants are present.
 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- 3.10 DUCT CLEANING
- A. Clean new duct system(s) before testing, adjusting, and balancing.
 - B. For cleaning of existing ductwork, see Section 230130.52 "Existing HVAC Air Distribution System Cleaning."
 - C. Use duct cleaning methodology as indicated in NADCA ACR.
 - D. Clean the following components by removing surface contaminants and deposits:
 1. Air outlets and inlets (registers, grilles, and diffusers).
 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 3. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 4. Supply-air ducts, dampers, actuators, and turning vanes.

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5. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

END OF SECTION 233113

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SECTION 233400 - HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fans, propeller - sidewall mounted.

1.2 ACTION SUBMITTALS

- A. Product data.
- B. Shop Drawings:
 - 1. Plans, elevations, sections, and attachment details.
 - 2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Diagrams for power, signal, and control wiring.
 - 4. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
 - 5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.3 INFORMATIONAL SUBMITTALS

- A. Startup service reports.
- B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 - 1. Operation in normal and emergency modes.
 - 2. Operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

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- B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of unit components.
- C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- E. Capacities and Characteristics:
 - 1. See drawings for schedule data.
 - 2. See drawings for drive arrangement data.
 - a. Motor Enclosure: Explosion proof.
 - b. Electrical Characteristics:
 - 1) See drawings for electrical characteristics
 - 3. Vibration Isolators: exhaust fan manufacturer provided isolators with a static deflection of 1 inch (25 mm) deflection>.
 - 4. Spark-Resistance Class: Classified in accordance with AMCA 99, Section 8, Type A.
- F. Service Conditions:

2.2 FANS, PROPELLER - SIDEWALL MOUNTED

- A. Standards: Comply with UL 705.
- B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring, with baked-enamel finish coat applied after assembly.
- C. Fan Wheels: Formed-steel blades riveted to heavy-gauge steel spider bolted to cast-iron hub.
- D. Fan Wheel: Replaceable, cast or extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- E. Fan Drive, Direct: Direct-drive motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- F. Fan Drive, Belt:
 - 1. Belt drive.
 - 2. Resiliently mounted to housing.
 - 3. Statically and dynamically balanced.
 - 4. Selected for continuous operation at maximum-rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
 - 5. Extend grease fitting to accessible location outside of unit.
 - 6. Service Factor Based on Fan Motor Size: 1.4.

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7. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
8. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - a. Ball-Bearing Rating Life: ABMA 9, L10 of 100,000 hours.
9. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
10. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
11. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

G. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Dampers: Counterbalanced, parallel-blade, backdraft dampers factory set to close when fan stops.
3. Motorized Dampers: Parallel-blade dampers with electric actuator wired to close when fan stops.
4. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
5. Wall Sleeve: Galvanized steel to match fan and accessory size.
6. Weathershield Hood: Galvanized steel to match fan and accessory size.
7. Weathershield Front Guard: Galvanized steel with expanded metal screen.
8. Belt Guard: For motor mounted on outside of fan cabinet. Comply with OSHA and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; 0.146-inch- (2.7-mm-) thick, 3/4-inch (20-mm) diamond-mesh wire screen, welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short-circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230500 "Common Work Results for HVAC."
- B. Where variable-frequency drives are indicated or scheduled, provide fan motor compatible with variable-frequency drive.

2.4 SOURCE QUALITY CONTROL

- A. AMCA Certification for Fan Sound Performance Rating: Test, rate, and label in accordance with AMCA 311.
- B. AMCA Certification for Fan Aerodynamic Performance Ratings: Test, rate, and label in accordance with AMCA 211.
- C. Fan Operating Limits: Classify fans in accordance with AMCA 99, Section 14.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install fans level and plumb.
- B. Disassemble and reassemble units, as required for moving to the final location, in accordance with manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.
- D. Equipment Mounting:
 - 1. Support duct-mounted and other hanging fans directly from the building structure, using suitable hanging systems as specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
 - 2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 - 3. Comply with requirements in Section 230548.13 "Vibration Controls for HVAC."
- E. Install units with adequate clearances for service and maintenance.
- F. Label fans in accordance with requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Where installing ducts adjacent to fans, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

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1. Nameplate is to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate is to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5 STARTUP SERVICE:

- A. Engage a factory-authorized service representative to perform startup service.
 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 2. Verify that shipping, blocking, and bracing are removed.
 3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 4. Verify that cleaning and adjusting are complete.
 5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
 6. For belt-drive fans, disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 7. Adjust belt tension.
 8. Adjust damper linkages for proper damper operation.
 9. Verify lubrication for bearings and other moving parts.
 10. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 11. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 12. Shut unit down and reconnect automatic temperature-control operators.
 13. Remove and replace malfunctioning units and retest as specified above.

3.6 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Lubricate bearings.
- D. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

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3.7 CLEANING

- A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
 - 1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safeties.
 - 3. Fans and components will be considered defective if they do not pass tests and inspections.
 - 4. Prepare test and inspection reports.

END OF SECTION 233400

SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. A: Ampere, unit of electrical current.
2. AC or ac: Alternating current.
3. AFCI: Arc-fault circuit interrupter.
4. AIC: Ampere interrupting capacity.
5. AL, Al, or ALUM: Aluminum.
6. ASD: Adjustable-speed drive.
7. ATS: Automatic transfer switch.
8. AWG: American wire gauge; see ASTM B258.
9. BAS: Building automation system.
10. BIL: Basic impulse insulation level.
11. BIM: Building information modeling.
12. CAD: Computer-aided design or drafting.
13. CATV: Community antenna television.
14. CB: Circuit breaker.
15. cd: Candela, the SI fundamental unit of luminous intensity.
16. CO/ALR: Copper-aluminum, revised.
17. COPS: Critical operations power system.
18. CU or Cu: Copper.
19. CU-AL or AL-CU: Copper-aluminum.
20. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
21. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
22. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
23. dBm: Decibel absolute power with respect to 1 mW.
24. DC or dc: Direct current.
25. DCOA: Designated critical operations area.
26. DDC: Direct digital control (HVAC).
27. EGC: Equipment grounding conductor.
28. ELV: Extra-low voltage.
29. EMF: Electromotive force.

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- 30. EMI: Electromagnetic interference.
- 31. EPM: Electrical preventive maintenance.
- 32. EPS: Emergency power supply.
- 33. EPSS: Emergency power supply system.
- 34. ESS: Energy storage system.
- 35. EV: Electric vehicle.
- 36. EVPE: Electric vehicle power export equipment.
- 37. EVSE: Electric vehicle supply equipment.
- 38. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion $1 \text{ fc} = 10 \text{ lx}$ in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
- 39. FLC: Full-load current.
- 40. ft: Foot.
- 41. ft-cd: Foot-candle, the antiquated U.S. Standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" after the SI unit candela (cd) replaced the international candle; see "fc,"
- 42. GEC: Grounding electrode conductor.
- 43. GFCI: Ground-fault circuit interrupter.
- 44. GFPE: Ground-fault protection of equipment.
- 45. GND: Ground.
- 46. HACR: Heating, air conditioning, and refrigeration.
- 47. HDPE: High-density polyethylene.
- 48. HID: High-intensity discharge.
- 49. HP or hp: Horsepower.
- 50. HVAC: Heating, ventilating, and air conditioning.
- 51. Hz: Hertz.
- 52. IBT: Intersystem bonding termination.
- 53. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
- 54. IP: Ingress protection rating (enclosures); Internet protocol (communications).
- 55. IR: Infrared.
- 56. IS: Intrinsically safe.
- 57. IT&R: Inspecting, testing, and repair.
- 58. ITE: Information technology equipment.
- 59. kAIC: Kiloampere interrupting capacity.
- 60. kcmil or MCM: One thousand circular mils.
- 61. kV: Kilovolt.
- 62. kVA: Kilovolt-ampere.
- 63. kVA_r or kVAR: Kilovolt-ampere reactive.
- 64. kW: Kilowatt.
- 65. kWh: Kilowatt-hour.
- 66. LAN: Local area network.
- 67. lb: Pound (weight).
- 68. lbf: Pound (force).
- 69. LCD: Liquid-crystal display.
- 70. LCDI: Leakage-current detector-interrupter.
- 71. LED: Light-emitting diode.
- 72. Li-ion: Lithium-ion.
- 73. lm: Lumen, the SI derived unit of luminous flux.
- 74. LNG: Liquefied natural gas.

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- 75. LP-Gas: Liquefied petroleum gas.
- 76. LRC: Locked-rotor current.
- 77. LV: Low voltage.
- 78. lx: Lux, the SI derived unit of illuminance equal to one lumen per square meter.
- 79. m: Meter.
- 80. MCC: Motor-control center.
- 81. MDC: Modular data center.
- 82. MG set: Motor-generator set.
- 83. MIDI: Musical instrument digital interface.
- 84. MLO: Main lugs only.
- 85. MV: Medium voltage.
- 86. MVA: Megavolt-ampere.
- 87. mW: Milliwatt.
- 88. MW: Megawatt.
- 89. MWh: Megawatt-hour.
- 90. NC: Normally closed.
- 91. Ni-Cd: Nickel-cadmium.
- 92. Ni-MH: Nickel-metal hydride.
- 93. NIU: Network interface unit.
- 94. NO: Normally open.
- 95. NPT: National (American) standard pipe taper.
- 96. OCPD: Overcurrent protective device.
- 97. ONT: Optical network terminal.
- 98. PC: Personal computer.
- 99. PCS: Power conversion system.
- 100. PCU: Power-conditioning unit.
- 101. PF or pf: Power factor.
- 102. PHEV: Plug-in hybrid electric vehicle.
- 103. PLC: Programmable logic controller.
- 104. PLFA: Power-limited fire alarm.
- 105. PoE: Power over Ethernet.
- 106. PV: Photovoltaic.
- 107. PVC: Polyvinyl chloride.
- 108. pW: Picowatt.
- 109. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
- 110. RMS or rms: Root-mean-square.
- 111. RPM or rpm: Revolutions per minute.
- 112. SCADA: Supervisory control and data acquisition.
- 113. SCR: Silicon-controlled rectifier.
- 114. SPD: Surge protective device.
- 115. sq.: Square.
- 116. SWD: Switching duty.
- 117. TCP/IP: Transmission control protocol/Internet protocol.
- 118. TEFC: Totally enclosed fan-cooled.
- 119. TR: Tamper resistant.
- 120. TVSS: Transient voltage surge suppressor.
- 121. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
- 122. UL CCN: UL Category Control Number.
- 123. UPS: Uninterruptible power supply.
- 124. USB: Universal serial bus.
- 125. UV: Ultraviolet.

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- 126. V: Volt, unit of electromotive force.
- 127. V(ac): Volt, alternating current.
- 128. V(dc): Volt, direct current.
- 129. VA: Volt-ampere, unit of complex electrical power.
- 130. VAR: Volt-ampere reactive, unit of reactive electrical power.
- 131. VFC: Variable-frequency controller.
- 132. VOM: Volt-ohm-multimeter.
- 133. VPN: Virtual private network.
- 134. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
- 135. W: Watt, unit of real electrical power.
- 136. Wh: Watt-hour, unit of electrical energy usage.
- 137. WPT: Wireless power transfer.
- 138. WPTE: Wireless power transfer equipment.
- 139. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

- 1. EMT: Electrical metallic tubing.
- 2. EMT-A: Aluminum electrical metallic tubing.
- 3. EMT-S: Steel electrical metallic tubing.
- 4. EMT-SS: Stainless steel electrical metallic tubing.
- 5. ENT: Electrical nonmetallic tubing.
- 6. EPEC: Electrical HDPE underground conduit.
- 7. EPEC-40: Schedule 40 electrical HDPE underground conduit.
- 8. EPEC-80: Schedule 80 electrical HDPE underground conduit.
- 9. EPEC-A: Type A electrical HDPE underground conduit.
- 10. EPEC-B: Type B electrical HDPE underground conduit.
- 11. ERMC: Electrical rigid metal conduit.
- 12. ERMC-A: Aluminum electrical rigid metal conduit.
- 13. ERMC-S: Steel electrical rigid metal conduit.
- 14. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
- 15. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
- 16. ERMC-SS: Stainless steel electrical rigid metal conduit.
- 17. FMC: Flexible metal conduit.
- 18. FMC-A: Aluminum flexible metal conduit.
- 19. FMC-S: Steel flexible metal conduit.
- 20. FMT: Steel flexible metallic tubing.
- 21. FNMC: Flexible nonmetallic conduit. See "LFNC."
- 22. HDPE: See EPEC.
- 23. IMC: Steel electrical intermediate metal conduit.
- 24. LFMC: Liquidtight flexible metal conduit.
- 25. LFMC-A: Aluminum liquidtight flexible metal conduit.
- 26. LFMC-S: Steel liquidtight flexible metal conduit.
- 27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
- 28. LFNC: Liquidtight flexible nonmetallic conduit.
- 29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
- 30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
- 31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
- 32. PVC: Rigid PVC conduit.
- 33. PVC-40: Schedule 40 rigid PVC conduit.

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34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERM-C-S-G.
38. RMC: See ERM-C.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. CATVP: Coaxial plenum cable.
4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.
11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.
17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.
27. ITC: Instrumentation tray cable.
28. ITC-ER: Instrumentation tray cable, exposed run.
29. MC: Metal-clad cable.
30. MC-HL: Metal-clad cable, hazardous location.
31. MI: Mineral-insulated, metal-sheathed cable.
32. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.
33. MV: Medium-voltage cable.

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- 34. NM: Nonmetallic sheathed cable.
- 35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
- 36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
- 37. NPLF: Non-power-limited fire-alarm circuit cable.
- 38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
- 39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
- 40. NUCC: Nonmetallic underground conduit with conductors.
- 41. OFC: Conductive optical fiber general-purpose cable.
- 42. OFCG: Conductive optical fiber general-purpose cable.
- 43. OFCP: Conductive optical fiber plenum cable.
- 44. OFCR: Conductive optical fiber riser cable.
- 45. OFN: Nonconductive optical fiber general-purpose cable.
- 46. OFNG: Nonconductive optical fiber general-purpose cable.
- 47. OFNP: Nonconductive optical fiber plenum cable.
- 48. OFNR: Nonconductive optical fiber riser cable.
- 49. P: Marine shipboard cable.
- 50. PLTC: Power-limited tray cable.
- 51. PLTC-ER: Power-limited tray cable, exposed run.
- 52. PV: Photovoltaic cable.
- 53. RHH: (high heat) Thermoset rubber, heat-resistant cable.
- 54. RHW: Thermoset rubber, moisture-resistant cable.
- 55. SA: Silicone rubber cable.
- 56. SE: Service-entrance cable.
- 57. SER: Service-entrance cable, round.
- 58. SEU: Service-entrance cable, flat.
- 59. SIS: Thermoset cable for switchboard and switchgear wiring.
- 60. TBS: Thermoplastic cable with outer braid.
- 61. TC: Tray cable.
- 62. TC-ER: Tray cable, exposed run.
- 63. TC-ER-HL: Tray cable, exposed run, hazardous location.
- 64. THW: Thermoplastic, heat- and moisture-resistant cable.
- 65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
- 66. THHW: Thermoplastic, heat- and moisture-resistant cable.
- 67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
- 68. TW: Thermoplastic, moisture-resistant cable.
- 69. UF: Underground feeder and branch-circuit cable.
- 70. USE: Underground service-entrance cable.
- 71. XHH: Cross-linked polyethylene, heat-resistant cable.
- 72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Abbreviations and Acronyms for Electrical Flexible Cord Types:

- 1. SEO: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
- 2. SEOW: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
- 3. SEOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.

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4. SEOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
5. SJEO: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
6. SJEW: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
7. SJEOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
8. SJEOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
9. SJO: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp locations.
10. SJOW: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
11. SJOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp locations.
12. SJOOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
13. SJTO: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
14. SJTOW: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
15. SJTOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
16. SJTOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
17. SO: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp locations.
18. SOW: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
19. SOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp locations.
20. SOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
21. STO: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
22. STOW: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.
23. STOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
24. STOOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.

E. Definitions:

1. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.

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2. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
3. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
4. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
5. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
6. Designated Seismic System: A system component that requires design in accordance with Chapter 13 of ASCE/SEI 7 and for which the Component Importance Factor is greater than 1.0.
7. Direct Buried: Installed underground without encasement in concrete or other protective material.
8. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
 - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
 - b. Concrete Box: A box intended for use in poured concrete.
 - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
 - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
 - e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
 - f. Device Box: A box with provisions for mounting a wiring device directly to the box.
 - g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
 - h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
 - i. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
 - j. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.

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- k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
 - l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
 - m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
 - n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
 - o. Raised-Floor Box: A floor box intended for use in raised floors.
 - p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
 - q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
 - r. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
 - s. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
 - t. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
9. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
10. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.
11. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
- a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
12. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
13. Jacket: A continuous nonmetallic outer covering for conductors or cables.

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14. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
15. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
16. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
17. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
18. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
19. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
20. Sheath: A continuous metallic covering for conductors or cables.
21. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
22. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
 - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
 - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
 - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
 - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
 - e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
 - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.
23. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

1.3 COORDINATION

- A. Interruption of Existing Electrical Service: See Drawing E.01, General Note 13.

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- B. Arrange to provide temporary electrical **power** in accordance with requirements specified in Division 01.
- C. Coordination Drawings for Structural Supports: Show coordination of structural supports for equipment and devices, including restraints and bracing for control of seismic and wind loads, with other systems, equipment, and structural supports in the vicinity.
- D. Coordination Drawings for Ceiling Areas: Where indicated on drawings, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which equipment and suspension systems will be attached.
 - 3. Size and location of access panels on ceilings.
 - 4. Elevation, size, and route of sprinkler piping.
 - 5. Elevation, size, and route of plumbing piping.
 - 6. Elevation, size, and route of ductwork.
 - 7. Elevation, size, and route of cable tray.
 - 8. Elevation, size, and route of conduit.
 - 9. Elevation and size of wall-mounted and ceiling-mounted equipment.
 - 10. Access panels.
 - 11. Sprinklers.
 - 12. Air inlets and outlets.
 - 13. Control modules.
 - 14. Luminaires.
 - 15. Communications devices.
 - 16. Speakers.
 - 17. Security devices.
 - 18. Fire-alarm devices.
 - 19. Indicate clear dimensions for maintenance access in front of equipment.
 - 20. Indicate dimensions of fully-open access doors.
- E. Coordination Drawings: Reflected ceiling plan(s), supplemented by sections and other details, drawn to scale on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Elevation, size, and route of cable trays.
 - 2. Relationships between components and adjacent structural, electrical, and mechanical elements.
 - 3. Vertical and horizontal offsets and transitions.
 - 4. Elevation and size of sleeves for wall, ceiling, and floor cable penetrations.
 - 5. Elevation of ceilings and size of ceiling tiles.
 - 6. Locations of access panels on ceilings.
 - 7. Locations where cable tray crosses or parallels sprinkler piping.
 - 8. Locations where cable tray crosses plumbing piping.
 - 9. Locations where cable tray crosses or parallels ductwork.
 - 10. Locations of access panels on ductwork.
 - 11. Locations where cable tray crosses conduit.
 - 12. Items blocking access around cable trays, including the following:

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- a. Light fixtures.
- b. Speakers.
- c. Fire-alarm devices.
- d. Power outlets.
- e. Wall-mounted equipment.
- f. Equipment racks.
- g. Furniture.
- h. Door swings.
- i. Building features.

1.4 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:

- 1. Submission of power system studies.
- 2. Submission of specified coordination drawings.
- 3. Submission of action submittals specified in Division 26.
- 4. Orders placed for major electrical equipment.
- 5. Arrival of major electrical equipment on-site.
- 6. Preinstallation meetings specified in Division 26.
- 7. Utility service outages.
- 8. Utility service inspection and activation.
- 9. Mockup reviews.
- 10. Closing of walls and ceilings containing electrical Work.
- 11. System startup, testing, and commissioning activities for major electrical equipment.
- 12. System startup, testing, and commissioning activities for emergency lighting.
- 13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
- 14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
- 15. Requests for special inspections.
- 16. Requests for inspections by authorities having jurisdiction.

- B. Delegated Design Drawings for Structural Masonry Wall Penetrations: Where indicated on Drawings, provide reflected ceiling plan(s), supplemented by elevations, sections, and other details, drawn to scale, signed and sealed by a qualified structural professional engineer, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

- 1. Location and dimensions of structural members supporting wall.
- 2. Location and dimensions of columns near penetrations.
- 3. Location and dimension of headers and lintels.
- 4. Doors and windows near penetrations.
- 5. Location and dimensions of penetrating cuts.
- 6. Sprinkler piping and sleeves.
- 7. Plumbing piping and sleeves.
- 8. Ductwork and sleeves.
- 9. Cable tray and sleeves.

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10. Conduit and sleeves.
11. Firestopping assemblies for rated penetrations.
12. Structural supports for piping, ductwork, and conduit on both sides of wall.

C. Certificates:

1. Welding certificates.

1.5 CLOSEOUT SUBMITTALS

A. **Updated** Facility EPM Program Binders:

1. Complete Set: On **USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.**
2. Volumes 2 and 8: Reproducible hardcopy on archival quality, 28 lb (105 GSM), acid-free, bond paper.

B. Operation and Maintenance Data:

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device listed below:
2. Include the following information:
 - a. Manufacturer's operating specifications.
 - b. User's guides for software and hardware.
 - c. Schedule of maintenance material items recommended to be stored at Project site.
 - d. Detailed instructions covering operation under both normal and abnormal conditions.
 - e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
 - f. List of load-current and overload-relay heaters with related motor nameplate data.
 - g. List of lamp types and photoelectric relays used on Project, with ANSI and manufacturers' codes.
 - h. Manufacturer's instructions for setting field-adjustable components.
 - i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
 - j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
 - k. Exterior pole inspection and repair procedures.

1.6 QUALIFICATIONS

- A. Qualified Regional Manufacturer: Manufacturer, possessing qualifications specified in Section 014000 "Quality Requirements," that maintains a service center capable of providing training, parts, and emergency on-site repairs to Project site with response time less than **eight hours.**

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- B. Electrical Professional Engineer: Professional engineer possessing active qualifications with expertise in electrical engineering, including electrical power system modeling and analysis of electrical safety in accordance with NFPA 70E.

1.7 MOCKUPS

- A. Simple Mockups for Coordinating Accessibility of Electrical Devices around Fixed Furnishings and Equipment:
 - 1. Build simple mockups using art supplies and other inexpensive materials for verification of general arrangement, actual dimensions, and accessibility prior to fabrication and installation of Work. Depict products from all Divisions requiring coordination including, but not limited to, fixed furnishings, casework, outlet covers and plates, HVAC controls, exposed raceway, exposed plumbing, equipment, and signage.
- B. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

1.8 FIELD CONDITIONS

- A. Modeling, analysis, product selection, installation, and quality control for Work specified in Division 26 must comply with requirements specified in Section 260011 "Facility Performance Requirements for Electrical."
- B. Service Conditions for Electrical Power Equipment: Besides conditions specified in Section 260011 "Facility Performance Requirements for Electrical," specified electrical power equipment must be suitable for operation under service conditions specified as usual service conditions in applicable NEMA PB series, IEEE C37 series, and IEEE C57 series standards.
 - a. Exposure to significant solar radiation.
 - b. Exposure to fumes, vapors, or dust.
 - c. Exposure to explosive environments.
 - d. Exposure to hot and humid climate or to excessive moisture, including steam, salt spray, and dripping water.
 - e. Unusual transportation or storage conditions.
 - f. Unusual grounding resistance conditions.
 - g. Unusual space limitations.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
 - 1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that

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substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.

2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

2.2 FACILITY ELECTRICAL PREVENTIVE MAINTENANCE (EPM) PROGRAM BINDERS

A. Description: Set of binders containing operation and maintenance data for facility's electrical equipment that was compiled during analysis of installed electrical Work for Facility EPM Program development.

B. Applicable Standards:

1. Regulatory Requirements: Comply with recommendations in NFPA 70B.
2. General Characteristics:
 - a. Volume 1 – Introduction.
 - b. Volume 2 - Facility Safety, Hazards Awareness, and Emergency Procedures:
 - 1) Include training requirements for employees and contractors.
 - 2) Include list of known facility hazards impacting IT&R activities.
 - 3) Include approval and permitting procedures for IT&R activities.
 - 4) Include incident emergency response procedures.
 - 5) Include emergency shutdown procedures.
 - 6) Include electrical disaster recovery procedures.
 - c. Volume 3 - Operating Procedures for Electrical Equipment and Controls:
 - d. Volume 4 - Facility Diagrams and Schedules:
 - 1) Include single-line diagrams.
 - 2) Include grounding and bonding diagrams.
 - 3) Include essential wiring diagrams.
 - 4) Include system automation diagrams (SCADA, BMS, lighting, HVAC, etc.).
 - 5) Include records of switchgear, switchboard, and panelboard schedules.
 - 6) Include time-current curves for overcurrent protective devices.
 - 7) Include list of load-current and overload-relay heaters with related motor nameplate data.
 - e. Volume 5 - Inventory of Facility Equipment Using Electrical Power:
 - 1) Include simplified floor plans showing equipment locations.
 - 2) Identify critical equipment (electrical or otherwise).
 - 3) Include identifying designations and nameplate data.

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- 4) Include warranty and maintenance contract information.
- f. Volume 6 - Inventory of Facility Tools, Supplies, and Personnel Protective Equipment:
 - 1) Include schedules of maintenance material items recommended to be stored at facility.
 - 2) Include list of lamp types and photoelectric relays used in facility with ANSI and manufacturers' codes.
 - 3) Include calibration and servicing data for each item.
- g. Volume 7 - Inspection, Testing, and Repair (IT&R) Plan:
 - 1) Include tables showing frequency of activities for each item.
 - 2) Include annual schedule with activities mapped to specific days of the year.
 - 3) Include exterior pole inspection and repair procedures.
- h. Volume 10 - Spare Parts List:
 - 1) Include list of all parts required to perform IT&R procedures.
 - 2) Identify quantities of which parts are recommended to be stored on-site.
 - 3) Include source contact information and budget cost for each item.
- i. Volume 11 - Construction Project Closeout Record Documentation:
 - 1) Include records of power system studies and photometric studies.
 - 2) Include records of risk assessment studies.
 - 3) Include records of electrical system startup and commissioning activities.
 - 4) Include records of baseline inspections and tests.
 - 5) Include records of baseline infrared photographs with normal light photographs showing the location, direction, angle, and conditions necessary for reproducing each infrared photograph.
 - 6) Include records of baseline settings for adjustable equipment and devices.

PART 3 - EXECUTION

3.1 DEVELOPMENT OF FACILITY EPM PROGRAM

- A. Facility EPM Program must be developed by qualified EPM specialist.
- B. Conduct Facility EPM Program analysis in accordance with NFPA 70B recommendations.
 - 1. Renovation Projects:
 - a. Facility diagrams must include connected existing equipment for entire facility where known. Areas of uncertainty should be clearly indicated.
 - b. Obtain copies of existing operation and maintenance data and existing Facility EPM Program information from Owner.

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- c. Facility EPM Program analysis should identify existing equipment that does not have available operation and maintenance data, and should explain the Owner's risks because this equipment is not included in Facility EPM Program.
 - d. Data for existing equipment outside scope of Project may be inserted in Facility EPM Program Binders without analysis.
 - e. Data for existing equipment impacted by scope of Project should be analyzed and documented similar to Project's new equipment data as much as possible.
- C. Compile operation and maintenance data from Facility EPM Program analysis and submit Facility EPM Program Binders.

3.2 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

3.3 FIELD QUALITY CONTROL

- A. Adminstrant for Low-Voltage Electrical Tests and Inspections.
- B. Adminstrant for Power-Limited Electrical Tests and Inspections:
 - 1. **Owner** will engage qualified power-limited electrical testing and inspecting agency to administer and perform tests and inspections.
 - 2. Engage qualified power-limited electrical testing and inspecting agency to administer and perform tests and inspections.
 - 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 - 4. Administer and perform tests and inspections.
- C. Adminstrant for Structural Tests and Inspections:
 - 1. **Owner** will engage qualified structural testing and inspecting agency to administer and perform tests and inspections.
 - 2. Engage qualified structural testing and inspecting agency to administer and perform tests and inspections.
 - 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 - 4. Administer and perform tests and inspections.

END OF SECTION 260010

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with **ASTM B8** for stranded conductors.

D. Conductor Insulation:

1. **Type RHH:** Comply with UL 44.
2. **Type THHN:** Comply with UL 83.
3. **Type THW:** Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

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2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: **Copper**.
 - 2. Type: **Two** hole with **standard** barrels.
 - 3. Termination: **Crimp**.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 - 1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 - 2. Copper for feeders smaller than No. 4 AWG; copper for feeders No. 4 AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
 - 1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 - 2. Copper, Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: **Type THHN/THWN-2, single conductors in raceway.**

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

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- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material **and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.**

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Intersystem bonding bridge grounding connector.
7. Grounding and bonding busbars.
8. Grounding (earthing) electrodes.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product indicated.

B. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control" Article, including the following:

1. Rod electrodes.
2. Ring electrodes.
3. Grounding arrangements and connections for separately derived systems.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, **THHN/THWN-2** wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Referenced Standards: Complying with one or more of the following:
 - a. Soft or Annealed Copper Wire: ASTM B3

2.2 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications; see Section 270526 "Grounding and Bonding for Communications Systems," for selection and installation guidelines.

B. Performance Criteria:

1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

C. UL KDER - Exothermically Welded Connection.

1. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING AND BONDING BUSHINGS

A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure.

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Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2.4 GROUNDING AND BONDING HUBS

A. Description: Hubs with certified grounding or bonding locknut.

B. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2.5 GROUNDING AND BONDING CONNECTORS

A. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2.6 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

- A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or structures.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2.7 GROUNDING AND BONDING BUSBARS

- A. Description: Miscellaneous grounding and bonding device that serves as common connection for multiple grounding and bonding conductors.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

2.8 GROUNDING (EARTHING) ELECTRODES

- A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:

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- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF BUSBARS

- A. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inch (50 mm) minimum from wall, 6 inch (150 mm) above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.3 SELECTION OF GROUNDING AND BONDING CONDUCTORS

- A. Conductors: Install solid conductor for **8 AWG** and smaller, and stranded conductors for **6 AWG** and larger unless otherwise indicated.
- B. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
- C. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch (6 mm) in diameter.
- D. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
- E. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch (41 mm) wide and 1/16 inch (1.6 mm) thick.
- F. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch (41 mm) wide and 1/16 inch (1.6 mm) thick.
- G. Underground Grounding Conductors: Install bare copper conductor, **2/0 AWG** minimum.

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1. Bury at least 30 inch (750 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inch (300 mm) above duct bank when indicated as part of duct-bank installation.

3.4 SELECTION OF CONNECTORS

A. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.5 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Conductors:
 - a. 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.
2. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - b. Make connections with clean, bare metal at points of contact.
 - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
 - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

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- f. 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 adjacent parts.
 - 2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.
- g. 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; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where 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 bolted connector.
 - 3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- 3. Electrodes:
 - a. Ground Rods: Drive rods until tops are 2 inch (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) Use exothermic welds for below-grade connections.
- 4. Grounding at Service:
 - a. Equipment grounding conductors and grounding electrode conductors must be connected to ground bus. Install main bonding jumper between neutral and ground buses.
- 5. Equipment Grounding:
 - a. Install insulated equipment grounding conductors with 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.

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- 4) Single-phase motor and appliance branch circuits.
 - 5) Three-phase motor and appliance branch circuits.
 - 6) Flexible raceway runs.
 - 7) Armored and metal-clad cable runs.
 - 8) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 9) X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.6 FIELD QUALITY CONTROL

- A. Testing Preparation:
- B. Field tests and inspections must be witnessed by **authorities having jurisdiction**.
- C. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
 3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, **and at individual ground rods**. Make tests at ground rods before conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- D. Nonconforming Work:
1. Grounding system will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective components and retest.

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- E. Collect, assemble, and submit test and inspection reports.
 - 1. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: **10 Ω .**
 - b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: **5 Ω .**
 - c. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: **3 Ω .**
 - d. Power Distribution Units or Panelboards Serving Electronic Equipment: **3 Ω .**

3.7 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

C. Delegated Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.

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- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch (10 mm) diameter holes at a maximum of 8 inch (200 mm) on center in at least one surface.
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Material for Channel, Fittings, and Accessories: **Galvanized steel.**
 - 3. Channel Width: **Selected for applicable load criteria.**
 - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: **Steel** hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
 - 5. Toggle Bolts: **All** steel springhead type.
 - 6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA NEIS 101

3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, **EMT** may be supported by openings through structure members, in accordance with 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 must 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 New Concrete: Bolt to concrete inserts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 3. To Existing Concrete: Expansion anchor fasteners.
 - 4. To Steel: **Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69, Spring-tension clamps.**
 - 5. To Light Steel: Sheet metal screws.
 - 6. 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.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

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3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

END OF SECTION 260529

SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT-A.
2. Fittings for conduit, tubing, and cable.
3. Electrically conductive corrosion-resistant compounds for threaded conduit.
4. Solvent cements.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. Conduit: A structure containing one or more duct raceways.

B. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Type EMT-A.
2. Fittings for conduit, tubing, and cable.
3. Electrically conductive corrosion-resistant compounds for threaded conduit.
4. Solvent cements.

B. Sustainable design submittals.

1. Solvent cements.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Type EMT-A.
2. Fittings for conduit, tubing, and cable.
3. Electrically conductive corrosion-resistant compounds for threaded conduit.
4. Solvent cements.

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PART 2 - PRODUCTS

2.1 TYPE EMT-A AND TYPE EMT-SS DUCT RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FJMX; including UL 797A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FJMX - Aluminum Electrical Metal Tubing (EMT-A) and Elbows:

1. Material: Aluminum.
2. Options:
 - a. Minimum Trade Size: **Metric designator 21 (trade size 3/4).**

2.2 TYPE EMT-S DUCT RACEWAYS AND ELBOWS

A. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

2.3 TYPE ENT DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FKHU; including UL 1653.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

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2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

2.4 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL EBMB - Duct Fittings for Hazardous (Classified) Locations:

1. Listing Criteria: UL CCN EBMB; including UL 1203.

D. UL DWTT - Fittings for Type ERM, Type IMC, Type PVC, Type HDPE, Type EPEC, and Type RTRC Duct Raceways:

1. Listing Criteria: UL CCN DWTT; including UL 514B.
2. Options:
 - a. Material: **Steel**.
 - b. Coupling Method: **Compression coupling**.
 - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

E. UL FKAV - Fittings for Type EMT Duct Raceways:

1. Options:
 - a. Material: **Steel**.
 - b. Coupling Method: **Compression coupling**.
 - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

F. UL ILNR - Fittings for Type FMC Duct Raceways:

1. Listing Criteria: UL CCN ILNR; including UL 514B.

G. UL DXAS - Fittings for Type LFMC and Type LFNC Duct Raceways:

1. Listing Criteria: UL CCN DXAS; including UL 514B.

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2.5 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR
THREADED CONDUIT

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:

2.6 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DWTT; including UL 514B.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation.
3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Special Instructions Regarding HDPE Conduits: Although Article 353 of NFPA 70 permits use of HDPE conduits where encased in concrete aboveground, UL CCN EAZX listing requirements state that HDPE underground conduits are intended only for use where direct

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buried with or without being encased in concrete. Specified Type HDPE underground conduits are not permitted to be used aboveground on Project.

C. Outdoors:

1. Exposed and Subject to Severe Physical Damage: **IMC, unless otherwise noted.**
2. Exposed and Subject to Physical Damage: **IMC, unless otherwise noted.**
 - a. Locations less than 2.5 m (8 ft) above finished floor.
3. Exposed and Not Subject to Physical Damage: **IMC, unless otherwise noted.**
4. Concealed Aboveground: **IMC, unless otherwise noted.**
5. Direct Buried: **PVC-40.**
6. Concrete Encased Not in Trench: **PVC-40.**
7. Concrete Encased in Trench: **PVC-40.**

D. Indoors:

1. Hazardous Classified Locations: **IMC, unless otherwise noted.**
2. Exposed and Subject to Severe Physical Damage: **IMC, unless otherwise noted.** Locations include the following:
 - a. Loading docks.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
3. Exposed and Subject to Physical Damage: **IMC, unless otherwise noted.** Locations include the following:
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - b. Stub-ups to above suspended ceilings.
4. Exposed and Not Subject to Physical Damage: **IMC, unless otherwise noted.**
5. Concealed in Ceilings and Interior Walls and Partitions: **IMC, unless otherwise noted.**
6. Damp or Wet Locations: **IMC, unless otherwise noted.**

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Type EMT-A: Article 358 of NFPA 70 and NECA NEIS 102.
2. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
3. Expansion Fittings: NEMA FB 2.40.
4. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:

- a. Complete duct raceway installation before starting conductor installation.
- b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft (0.6 m) above finished floor.
- c. Install no more than equivalent of three 90-degree bends in conduit run **except for control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted.** Support within 12 inch (300 mm) of changes in direction.
- d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
- e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- f. Support conduit within 12 inch (300 mm) of enclosures to which attached.

D. Interfaces with Other Work:

1. Coordinate installation of new products with existing conditions.
2. Coordinate with Section 260529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533.13

SECTION 260533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

C. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

PART 2 - PRODUCTS

2.1 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

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1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN QCIT; including UL 514A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT - Metallic Outlet Boxes and Covers:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.

D. UL QCIT - Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

E. UL QCIT - Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Options:
 - a. Material: **Sheet steel**.

2.2 JUNCTION BOXES AND PULL BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN BGUZ; including UL 50 and UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation for adhesive solvents:
3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

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C. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2.3 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN QCIT or UL CCN QCMZ; including UL 514D.
3. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation for adhesive solvents:
3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

PART 3 - EXECUTION

3.1 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
- C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:
 1. **Provide cast-metal boxes. Boxes with knockouts or unprotected openings are prohibited.**
 2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.2 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

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1. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
2. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to **top** of box unless otherwise indicated.
3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
5. Locate boxes so that cover or plate will not span different building finishes.
6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
9. Set metal floor boxes level and flush with finished floor surface.
10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
 - a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
 - b. Provide gaskets for wallplates and covers.
14. Identification: Provide labels for boxes and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Provide warning signs.
 - c. Label each box with engraved metal or laminated-plastic nameplate.

END OF SECTION 260533.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands and tubes.
3. Tapes and stencils.
4. Tags.
5. Signs.
6. Cable ties.
7. Miscellaneous identification products.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with 29 CFR 1910.144 for color identification of hazards; 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs and tags.

C. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.

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3. Safety Symbols: NEMA Z535.3.
 4. Product Safety Signs and Labels: NEMA Z535.4.
 5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
- D. Comply with **NFPA 70E** requirements for arc-flash warning labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 1000 V or Less:
1. **Black letters on orange field.**
- B. Color-Coding for Phase- Identification, 1000 V or Less: Use colors listed below for ungrounded **service feeder and branch-circuit** conductors.
1. Color must be factory applied.
 2. Colors for 208Y/120 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 3. Colors for 480Y/277 V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 4. Color for Neutral: **White**.
 5. Color for Equipment Grounds: **Green**.
 6. Colors for Isolated Grounds: Green with two or more yellow stripes.
- C. Warning Label Colors:
1. Identify system voltage with black letters on orange background.
- D. Warning labels and signs must 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 3 FEET MINIMUM."

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E. Equipment Identification Labels:

1. Black letters on white field.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
- C. Self-Adhesive Wraparound Labels: **Preprinted**, 3 mil (0.08 mm) thick, flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.
2. Marker for Labels:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

- D. Self-Adhesive Labels: **Polyester**, thermal, transfer-printed, 3 mil (0.08 mm) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:
 - a. 1-1/2 by 6 inch (37 by 150 mm) for raceway and conductors.
 - b. 3-1/2 by 5 inch (76 by 127 mm) for equipment.
 - c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

- A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at maximum of 200 deg F (93 deg C). Comply with UL 224.

2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

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- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil (0.08 mm) thick by 1 to 2 inch (25 to 50 mm) wide; compounded for outdoor use.
- C. Tape and Stencil: 4 inch (100 mm) wide black stripes on 10 inch (250 mm) centers placed diagonally over orange background and are 12 inch (300 mm) wide. Stop stripes at legends.
- D. Stenciled Legend: In nonfading, waterproof, **black** ink or paint. Minimum letter height must be **1 inch (25 mm)**.

2.6 TAGS

- A. Write-on Tags:
 - 1. Polyester Tags: **0.010 inch (0.25 mm)** thick, with corrosion-resistant grommet and cable tie for attachment.
 - 2. Marker for Tags:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C) in accordance with ASTM D638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C) in accordance with ASTM D638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C) in accordance with ASTM D638: 7000 psi (48.2 MPa).
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).

5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

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- J. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
- K. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.
- L. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.
- M. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.
- N. Self-Adhesive Labels:
 - 1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch (13 mm) high letters on 1-1/2 inch (38 mm) high label; where two lines of text are required, use labels 2 inch (50 mm) high.
- O. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.
- P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.
- Q. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.
- R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

END OF SECTION 260553

SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution, dry-type transformers with nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:

1. Transformer working clearances, anchoring, torque values, and insulation-resistance testing.

B. Source quality-control reports.

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PART 2 - PRODUCTS

2.1 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60 Hz service.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Transformers Rated 15 kVA and Larger:
 - 1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
 - 2. Marked as compliant with DOE 2016 efficiency levels by qualified electrical testing laboratory recognized by authorities having jurisdiction.

2.2 DISTRIBUTION TRANSFORMERS

- A. Comply with NFPA 70, and list and label as complying with UL 1561.
- B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
 - 1. One leg per phase.
- C. Coils: Continuous windings without splices except for taps.
 - 1. Coil Material: Aluminum.
 - 2. Internal Coil Connections: Brazed or pressure type.
 - 3. Terminal Connections: Welded.
- D. Encapsulation: Transformers smaller than 30 kVA must have core and coils completely resin encapsulated.
- E. Enclosure: Ventilated.
 - 1. Core and coil must be encapsulated within resin compound to seal out moisture and air.
 - 2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
 - 3. Wiring Compartment: Sized for conduit entry and wiring installation.
 - 4. Environmental Protection:
 - a. Indoor: UL 50E, Type 2.
- F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- G. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with maximum of 115 deg C rise above 40 deg C ambient temperature.
- H. Grounding: Provide ground-bar kit or ground bar installed on inside of transformer enclosure.

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2.3 IDENTIFICATION

A. Nameplates:

1. Engraved, laminated-acrylic or melamine plastic signs for distribution transformers, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."
2. Self-adhesive label for distribution transformers. Self-adhesive labels are specified in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for transformers.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's published instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be $5\ \Omega$ at location of transformer.
- E. Environment: Enclosures must be rated for environment in which they are located. Covers for UL 50E, Type 4X enclosures may not cause accessibility problems.

3.2 INSTALLATION

- A. Construct concrete bases and anchor floor-mounted transformers in accordance with manufacturer's published instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
 1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- B. Secure transformer to concrete base in accordance with manufacturer's published instructions.
- C. Secure covers to enclosure and tighten bolts to manufacturer-recommended torques to reduce noise generation.
- D. Remove shipping bolts, blocking, and wedges.

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3.3 CONNECTIONS

- A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Provide flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to building structure.

3.4 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 - 1. Small (Up to 167 kVA Single-Phase or 500 kVA Three-Phase) Dry-Type Transformer Field Tests:
 - a. Visual and Mechanical Inspection.
 - 1) Inspect physical and mechanical condition.
 - 2) Inspect anchorage, alignment, and grounding.
 - 3) Verify that resilient mounts are free and that shipping brackets have been removed.
 - 4) Verify that unit is clean.
 - 5) Perform specific inspections and mechanical tests recommended by manufacturer.
 - 6) Verify that as-left tap connections are as specified.
 - 7) Verify presence of surge arresters and that their ratings are as specified.
 - b. Electrical Tests:
 - 1) Measure resistance at windings, taps, and bolted connections.
 - 2) Perform insulation-resistance tests winding-to-winding and windings-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: value of index may not be less than 1.0.
 - 3) Perform turns-ratio tests at tap positions. Test results may not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.
 - 4) Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

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- C. Test Labeling: On completion of satisfactory testing of units, attach dated and signed "Satisfactory Test" label to tested components.
- D. Nonconforming Work:
 - 1. Transformer will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace units that do not pass tests or inspections and retest as specified above.
- E. Assemble and submit test and inspection reports.

3.5 CLEANING

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262213

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panelboards.
2. Disconnecting and overcurrent protective devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other requirements applicable to the Work for electrical, communications, and electronic safety and security systems on Project, including wiring methods.
2. Section 260529 "Hangers and Supports for Electrical Systems" specifies concrete bases and supports for panelboards installed by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
4. Section 262813 "Fuses" specifies fuses and spare-fuse cabinets installed by this Section.

1.2 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. In addition to information identified in Section 013300 "Submittal Procedures," submit the following:

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

- B. Shop Drawings: For each panelboard and related equipment:

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for SPD as installed in panelboard.

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7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.

C. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

B. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Field reports for voltage monitoring and adjusting.
3. Field reports for infrared scanning.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 QUALIFICATIONS

A. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

1. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation in accordance with NEMA PB 1.

1.8 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

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- B. Special Manufacturer Extended Warranty: Manufacturer warrants that panelboards perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
 - 1. Initial Extended-Warranty Period: Four years from date of Substantial Completion; full coverage for labor, materials, and equipment.
 - 2. Follow-On Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for materials that failed because of transient voltage surges only, free on board origin, freight prepaid.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Comply with NEMA PB 1.
- D. Enclosures: Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Other Wet or Damp Indoor Locations: UL 50E, Type 4.
 - 2. Height: 7 ft maximum.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
 - 4. Finishes:
 - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
- E. Phase, Neutral, and Ground Buses:
 - 1. Material: Tin-plated aluminum.
 - a. Plating must run entire length of bus.
 - b. Bus must be fully rated for entire length.
 - 2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.

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3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- F. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
 2. Terminations must allow use of 75 deg C rated conductors without derating.
 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 4. Main and Neutral Lugs: Mechanical type, with lug on neutral bar for each pole in panelboard.
 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for each pole in panelboard.
- G. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- H. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: 10 percent.
- I. Panelboard Short-Circuit Current Rating:
1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.
 - a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
 - b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

2.2 PANELBOARDS

- A. UL QEUY - Distribution Panelboard:
1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Distribution Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.

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2. Standard Features:
 - a. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1) For doors more than 36 inch high, provide two latches, keyed alike.
 - b. Mains: Circuit breaker.
 - 1) Location: Top.
 - 2) Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.
 - c. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
3. Other Available Features Required by Project:
 - a. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD Type 2.
 - b. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
 - c. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
 - d. Do not mount neutral bus in gutter.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on off position.

- B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Provide fuses and spare fuse cabinet.

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2. Fused Switch Features and Accessories:

- a. Standard ampere ratings and number of poles.
- b. Mechanical cover interlock with manual interlock override, to prevent opening of cover when switch is in on position. Interlock must prevent switch from being turned on with cover open. Operating handle must have lock-off means with provisions for three padlocks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards in accordance with NEMA PB 1.1.

3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA PB 1.1.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Equipment Mounting:
 - a. Mount surface-mounted panelboards to steel slotted supports **5/8 inch (16 mm)** in depth. Orient steel slotted supports vertically.
2. Mount top of trim 7.5 ft above finished floor unless otherwise indicated.
3. Mount panelboard cabinet plumb and rigid without distortion of box.
4. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
5. Install filler plates in unused spaces.
6. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

D. Interfaces with Other Work:

1. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

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3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Install warning signs.
- C. Panelboard Nameplates: Label each panelboard with nameplate.
- D. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.
- E. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.
- F. Circuit Directory:
 - 1. Provide directory card inside panelboard door, mounted in transparent card holder.
 - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
 - 2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

3.4 FIELD QUALITY CONTROL

- A. Administrant for Low-Voltage Electrical Tests and Inspections:
 - 1. Engage qualified low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Field tests and inspections must be witnessed by authorities having jurisdiction.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Do not perform optional tests. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:

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- a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- E. Nonconforming Work:
- 1. Panelboards will be considered defective if they do not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- 1. Include certified report that identifies panelboards included and that describes scanning results, with comparisons of two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- G. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches, dimmer switches, and fan-speed controller switches.
2. General-grade single straight-blade receptacles.
3. General-grade duplex straight-blade receptacles.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 262726.33 "General-Grade Duplex Straight-Blade Receptacles" for additional wiring device products.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Toggle switches.
2. Fan-speed controllers.
3. Duplex straight-blade receptacles.

B. Shop Drawings:

1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.

C. Samples:

1. One for each kind of fan-speed controller switch **and cover plate accessory** specified, in each finish and color specified.
2. One for each kind of duplex straight-blade receptacle **and cover plate accessory** specified, in each finish and color specified.

D. Field Quality-Control Submittals:

1. Field quality-control reports.

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1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturers' Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:
1. Fan-speed controllers.
 2. Single straight-blade receptacles.
 3. Duplex straight-blade receptacles.

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

- A. Toggle Switch:
1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. General Characteristics:
 - a. Reference Standards: UL CCN WMUZ and UL 20.

2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

- A. Duplex Straight-Blade Receptacle:
1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
 3. Options:
 - a. Device Color: **Ivory**.
 - b. Configuration:
 - 1) General-duty, **NEMA 5-15R**.
 4. Accessories:

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- a. Cover Plate: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.
- B. Tamper-Resistant Duplex Straight-Blade Receptacle:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
 - 3. Options:
 - a. Device Color: **Ivory**.
 - b. Configuration:
 - 1) General-duty, **NEMA 5-15R**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receptacles:
 - 1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

- A. Comply with manufacturer's instructions.
- B. Reference Standards:
 - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
 - 2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
 - 3. Consult Architect for resolution of conflicting requirements.

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

- A. Comply with manufacturer's instructions.

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B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
 - a. Hospital-Grade Receptacle Orientation: Orient receptacle with ground pin or neutral pin at top.
4. Consult Architect for resolution of conflicting requirements.

3.4 FIELD QUALITY CONTROL OF SWITCHES

A. **Acceptance** Testing Preparation.

B. Field tests and inspections must be witnessed by **authorities having jurisdiction**.

C. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' instructions.

D. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Assemble and submit test and inspection reports.

F. Manufacturer Services:

1. Engage factory-authorized service representative to **support** field tests and inspections.

3.5 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. **Acceptance** Testing Preparation.

B. Field tests and inspections must be witnessed by **authorities having jurisdiction**.

C. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.

D. Nonconforming Work:

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1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Assemble and submit test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments for Controlled Receptacles: When requested within **12** months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to **two** visits to Project during other-than-normal occupancy hours for this purpose.

3.7 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

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SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonrenewable cartridge fuses.
2. Spare-fuse cabinets.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
2. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Coordination charts and tables and related data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 NONRENEWABLE CARTRIDGE FUSES

A. Class RK1 Nonrenewable Cartridge Fuse:

1. Listing Criteria: Investigated, labeled, and marked by a qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Cartridge Fuses, Nonrenewable: UL CCN JDDZ, including UL 248-1 and UL 248-12 (Class R).
2. Standard Features:

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- a. NEMA FU 1, Class RK1, 200 kA(sym) interrupt rating, current limiting, sizes up to 600 A, 250 V(ac), 8 to 10 s minimum time-delay at 500 percent, with rejection feature.
 - 1) Select ferrule terminals or knife blade terminals to match equipment where fuse is installed.

2.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION OF FUSES

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
 - 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
 - 2. Electrical Maintenance: NFPA 70B.
 - 3. Electrical Safety: NFPA 70E.
 - 4. Work in Confined Spaces: NFPA 350.
 - 5. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
 - 6. Fuse Applications: NECA NEIS 420.
- C. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- D. Install spare-fuse cabinet(s) in location indicated on the Drawings or as indicated in the field by Owner.
- E. Interfaces with Other Work:
 - 1. Identification: Provide labels for spare fuse cabinet.
 - a. Legend: "SPARE FUSES" in 1-1/2 inch high letters on exterior of door.
 - 2. Coordinate fuse ratings with design documents.

END OF SECTION 262813

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of LED luminaires:

1. Surface mount, linear.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
2. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

- B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.
- B. Product Certificates: For each type of luminaire.
- C. Product test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

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1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: **Five** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Ambient Temperature: **41 to 104 deg F (5 to 40 deg C).**
 - 1. Relative Humidity: Zero to 95 percent.
- B. Altitude: Sea level to **1000 feet (300 m).**

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI.

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- C. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- D. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- E. California Title 24 compliant.

2.3 CYLINDER

- A. Nominal Operating Voltage: As indicated.
- B. Lamp: As indicated.
- C. Housings: As indicated.
- D. Diffusers and Globes: As indicated.

2.4 SURFACE MOUNT, LINEAR

- A. Nominal Operating Voltage: As indicated.
- B. Lamp: As indicated.
- C. Housings: As indicated.
- D. Diffusers and Globes: As indicated.

2.5 METAL FINISHES: As indicated

2.6 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:

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1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position after cleaning and relamping.
 3. Provide support for luminaire without causing deflection of ceiling or wall.
 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Luminaire Lighting Controls."
- B. Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."

END OF SECTION 265119

SECTION 315010

UNDERPINNING

SECTION 315010 - UNDERPINNING

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 underpinning.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review geotechnical report.
 - 2. Review existing utilities and subsurface conditions.
 - 3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
 - 4. Review proposed excavations.
 - 5. Review proposed equipment.
 - 6. Review monitoring of excavation support and protection system.
 - 7. Review coordination with waterproofing.
 - 8. Review abandonment or removal of excavation support and protection system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for underpinning.
- B. Shop Drawings: For underpinning system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.
 - 2. Show arrangement, underpinning according to engineering design.
- C. Delegated-Design Submittal: For underpinning systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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UNDERPINNING

1.5 MATERIAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Professional Engineer: Experience with providing delegated-design engineering services of the type indicated, including documentation that engineer is licensed in the state in which Project is located.
- B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility-serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Engineer no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Engineer's written permission.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks, and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design underpinning systems to resist all vertical and lateral loading and surcharge, including but not limited to, retained soil, groundwater pressure, existing building loads, adjacent building loads, adjacent traffic loads, construction traffic loads, material stockpile loads, and seismic loads, based on the following:
 - 1. Compliance with OSHA Standards and interpretations, 29 CFR 1926, Subpart P.
 - 2. Compliance with requirements of authorities having jurisdiction.
 - 3. Compliance with utility company requirements.

2.2 MATERIALS

- A. Provide materials that are either new or in serviceable condition.

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UNDERPINNING

- B. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- C. Reinforcing Bars: ASTM A615/A615M, Grade 60 , deformed.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.

3.2 INSTALLATION - GENERAL

- A. Locate excavation underpinning systems clear of new permanent construction, so that construction and finishing of other work is not impeded.
- B. Install underpinning systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Install underpinning systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

3.3 UNDERPINNING

- A. Install underpinning under existing structures as required to provide permanent vertical and lateral support for the existing construction during the process of excavation and construction for the new adjacent structures
- B. Underpinning shall consist of solid concrete the full width of the existing foundations to be underpinned from the bottom of the existing footing to the appropriate grade.
 - 1. Install the underpinning in vertical and horizontal unit dimensions as required for safe installation.
 - 2. Install tie backs as required.
 - 3. Ensure there are no voids under the existing structure.

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3.4 MAINTENANCE

- A. Monitor and maintain underpinning system.
- B. Prevent surface water from entering excavations by grading, dikes, or other means.
- C. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

3.5 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.
 - 1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
 - 2. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

END OF SECTION 315010